Male Genitalia as Taxonomic Characters in the Miridae (Hemiptera)

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INTRODUCTION

The male genitalia, particularly the claspers and certain details of the vesica, have been used previously to define species of Miridae, and to a certain extent to determine their relationships. Reuter (1883), and particularly Knight (1917), showed the differentiating characters in the claspers, and Knight (1923), Wagner (1940), Southwood (1953), and Kelton (1955) demonstrated that the details of the vesica might be used in specific determinations and as indicators of relationship.

However, the basic structural pattern of the vesica has not previously been tested or observed for stability within large groups, or its significance in the classification of the Miridae determined. This is a report on a comparison of the male copulatory structures and their modifications within the tribes and subfamilies, and on the phylogenetic relationships between species, genera, and higher categories of the family. The study indicates where the present classification, based on external characters, is somewhat unsatisfactory, and where more intensive work is needed to throw some light upon generic relationships.

The existing classification is based primarily on the arolia, which have been assumed to be distinctive for each subfamily, but no extensive study has previously been made to determine whether the arolia or the vesica is the more stable in certain species that differ markedly in external appearance from others of the tribe or subfamily. Kullenberg (1947b) suggested that the tarsal claw structures are not of high phylogenetic value and that they are highly adaptable and unstable, so as to be not nearly so significant for establishing relationships as are the female genitalia. The present study supports this view, as the genitalia display common characters in groups in which the claw structures and external appearances vary considerably. As more species are studied it will probably be found that the phylogenetic value of the arolia has been overestimated, and that they are too plastic to serve as a fundamental subfamily characteristic. However, the arolia are of considerable importance as they are readily accessible and are still extremely useful in the preliminary classification of the majority of species, but they must be interpreted with caution in separating certain species.

The part of the genitalia that exhibits characters of highest taxonomic and phylogenetic value is the vesica, which includes such structures as the gonopore, the ductus seminis, and the processes surrounding the gonopore. These structures may be used in defining species and genera. The phallotheca also appears to be of some value in specific determination and undoubtedly the phallobase has reliable characters for distinguishing tribes and subfamilies. However, in this study, attention was concentrated on the vesica as it showed appreciable differences even within closely related groups, and offered striking differences between remotely related species.

The pattern of the vesica within species did not vary significantly. As incomplete inflation contributed substantially to variations in appearance of vesicae of certain species, specimens in which the vesicae were adequately inflated were

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generally used for comparisons. Where scarcity of material made this practice untenable, the vesicae are illustrated at the maximum inflation achieved; however, the basic details are indicated to allow recognition of the species.

The procedure for inflating the vesica, particularly important in the Mirinae, Deraeocorinae, and others, was as follows: First, the posterior portion of the abdomen was detached and placed in approximately 10 per cent hot KOH. After three to five minutes, the portion was transferred to a depression slide and dissected in KOH under the microscope. The phallus was then separated from the genital capsule and transferred to a depression slide containing distilled water. Difference in osmotic pressure caused the membranous processes, when present, to expand and protrude through and beyond the opening of the phallotheca. Usually, lobes extended fully in about five minutes. If, however, the lobes did not inflate in that time, the phallus was removed from the water and placed in KOH for a second or two, and immediately returned to distilled water. At maximum expansion the vesicae were studied; together with the claspers, they were then neutralized in dilute acetic acid and placed in microvials containing a very small quantity of glycerine. The microvials were then attached by their corks to the pins holding the specimens.

The claspers, vesicae, and other structures illustrated were drawn to the same scale unless otherwise indicated. All the illustrations were prepared with the aid of an ocular grid at X75 magnifications.

The structures were drawn in the position that most clearly displayed the distinctive features of the species. For the purpose of comparison structures were drawn from nearly the same view.

The number of species examined was sufficient only for tentative conclusions. However, the genitalia studied suggested structural similarity between related species, and further suggested a considerable degree of relationship between various genera and higher categories of the family. Further studies of the male and female genitalia are necessary before the relationships of genera and tribes can be accurately determined.

Where possible the groups investigated by Slater (1950) were studied, along with several diversified groups. It is hoped that the taxonomic characters and relationships revealed herein may form a basis for analysing the species groups and the classification of the Miridae.

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TERMINOLOGY

The terminology of the structures studied is not extensive or complicated. The taxonomic or morphological studies of Knight (1917), Singh-Pruthi (1925),

Ludwig (1926), Baker (1931), Snodgrass (1935), Kullenberg (1941), Michener (1944), Marks (1951), Truxal (1952), and Bonhag and Wick (1953) provided the following terms. The terms *clasper* and *paramere* are generally accepted for the clasping organ of Heteroptera, and the former is used in this study because of its long-established usage by specialists in the Miridae of North America. The *harpagones* of Snodgrass (1935), *gonoforceps* of Michener (1944), and *gonostyli* of Bonhag and Wick (1953) are synonymous with the two former terms. The terminology for the various regions of the claspers is that of Kullenberg (1947b), with minor modifications.

The term *vesica* is used herein to refer to structures beyond the phallobase, including the ductus seminis (in part) and its gonopore, and the processes of the vesica (processus vesicae of Dupuis and Carvalho, 1956). *Vesica* is synonymous with *virga* of Crampton (1922); with *endosoma*, *ejaculatory duct*, and *vesical appendages* of Singh-Pruthi (1925); with *aedeagus* of Snodgrass (1935); and with *disticonjuctiva*, *cricoid sclerite*, and *vesica* of Bonhag and Wick (1953). The secondary gonopore (Dupuis and Carvalho, 1956), that is, the terminal opening of the ductus seminis, is called the *gonopore* for brevity. The term *phallus* is used to designate the intromittent organ as a whole; the *phallobase* is the sclerotized basal region of the phallus. The *phallotheca* is the structure enclosing the phallus (Snodgrass, 1935), and is the part exposed when the phallus is in a state of repose.

HISTORICAL REVIEW

The first attempt to use the genitalia as a taxonomic tool in the Miridae was that of Reuter (1883), who dissected and illustrated the claspers to show differences between species. Van Duzee (1916) attempted to classify the North American species of *Orthotylus* on the basis of the clasper, and Knight (1916) compared and illustrated the claspers of two very closely related species of *Lygus*. Crampton (1922) and Hussey (1922) identified the species of *Lopidea* and *Orthotylus* respectively on the basis of the claspers. Lindberg (1930) and Stichel (1930) relied on the claspers to separate species of *Lygus* and *Orthops* respectively; and Miller (1937) figured the claspers to identify species of *Parasthenaridea*. Wagner (1939) figured the claspers of *Alloeotomus* with the description, and Schmidt (1939) illustrated them with the descriptions of *Laemocoris* and *Psallus*. Hsiao (1941) figured the claspers with the description of *Aretas*. Stanger (1942) and Taylor (1947) used the claspers to point out specific differences in species of *Lygus*. Kirichenko (1951) illustrated the claspers of several species of Orthotylinae and Phylinae. Linnavuori (1951) illustrated the claspers with the description of *Calocoris*. Leston (1952) attempted to show the relationships between the species of *Lygus* on the basis of the claspers. Bliven (1954) included illustrations of the claspers with descriptions of some species of *Phytocoris* and *Dichrooscytus*. Seidenstücker (1954a) and Woodward (1954) figured the claspers with descriptions of *Brachynotocoris* and *Felisacus* species respectively.

The most basic work on the internal male genitalia of the Hemiptera was that of Singh-Pruthi (1925). He analysed the structural details of the genitalia and showed characters useful in the study of group relationships. This contribution to the knowledge of the genitalia played an important part in the taxonomy of the Miridae, particularly in recent years since characters of the vesica came into use.

The following authors also considered the vesica, in addition to the claspers, in taxonomic studies of the species: Knight (1923) made extensive use of the vesica (flagellum) in separating species of *Phytocoris*; Usinger (1931) illustrated a portion of the vesica with the description of *Platylygus*; Wagner (1940) utilized

the details of the vesicae in distinguishing between the European species of *Lygus*; and Kullenberg (1941) illustrated the vesicae of *Phytocoris*, *Lygus*, and the Phylinae groups in a study of the male genitalia in the Miridae. China (1944) used the vesicae for identification of species of Bryocorinae and others; Carvalho (1944) illustrated these structures in the revision of *Eurylomata*; Hoberlandt and Jordan (1944) compared *Camponotidea* and *Myrmecoris* by illustrating the vesicae, Lindberg (1951) used the vesica to separate species of *Canariocoris*; Linnavuori (1952) included the vesicae with descriptions of *Atomoscelis*; Stehlík (1952) illustrated the details of the vesica in species of *Orthotylus*; Carvalho and Sailer (1953) included the vesicae with descriptions of *Ofellus*; and Ossiannilsson (1953), Seidenstücker (1954b), and Moore (1955) did likewise in describing species of *Psallus*, *Dichrooscytus*, and *Agnocoris*, respectively.

In addition to the claspers and the vesica, Wagner and Slater (1952) used the female genitalia to demonstrate specific differences in a number of Holarctic species of *Lygus* and *Monalocoris*. Southwood (1953) studied the male and the female genitalia of *Orthotylus*, and Kelton (1955) used the characters of the genitalia of both sexes to group species of the *Lygus* complex into genera and subgenera.

INTERRELATIONS OF THE SUBFAMILIES

The present classification of the Miridae is based primarily on the tarsal claw characters suggested by Reuter (1910) and elaborated by Knight (1918). The latest classification available is that of Carvalho (1955), who lists six subfamilies.

In this study, no emphasis was placed on any subfamily, and the number of species examined in each group was determined by the available type material. The large size of the family and the limitations of collections made it impossible to study more than an extremely small percentage of the species, representing only a relatively small number of genera. However, in order to observe the diversity of the genitalia, typical species and some that differ markedly in external appearance were studied in each tribe or subfamily.

The study includes material from only 17 tribes, representing the six subfamilies of Carvalho. The subfamily distinctions and the allocation of genera proposed by Carvalho generally agree with the relationships indicated by the male genitalia. However, the genitalia of certain species suggested a closer relationship to species of other tribes of the same subfamily; and several genera placed in particular subfamilies on the basis of the arolia are not so related on the basis of the genitalia.

The relationships of genera indicated by the female genitalia studied by Slater (1950) appear to be in general agreement with the relationships suggested by the male genitalia. However, in a number of instances the variation in the basic pattern of the male genitalia appears to be less than in the female. Probably the male genitalia are better indicators of relationship in some groups than the female genitalia, and vice versa.

The species of the Bryocorinae studied appear to have two types of simple vesica. In the first type, the ductus seminis is very long, membranous on the basal half, but sclerotized on the distal half. In the second type, the ductus seminis is very short and either flexible or sclerotized. In both groups the phallotheca is membranous (Figs. 142-146). The vesica thus suggests that two groups are represented by the species studied in the tribe, and that no close relationship is suggested to the other subfamilies.

In the Phylinae, excluding the Dicyphini, the vesica is also of a simple type. The vesica is sclerotized and the ductus seminis is rigid except at the point of articulation with the "Führungsstück" of Kullenberg (1941). The phallotheca

is also sclerotized, and pointed at the apex (Fig. 111). The claspers are distinctive and in combination with the vesica are characteristic of the subfamily.

The tribe Dicyphini, now included in the Phylinae, shows no affinity to the other two tribes in the subfamily on the basis of the vesica. The vesica is highly membranous, the ductus seminis is flexible throughout, and the processes of the vesica completely enclose the diffuse gonopore (Figs. 131-137). This type of vesica is completely different from those of the Phylini or the Hallodapini, and shows a much closer affinity to those of the Cylapinae (Figs. 139-141), and possibly to the Deraeocorinae (Figs. 107-110).

A close relationship between the Phylinae and the Orthotylinae was suggested by Slater (1950) on the basis of the female genitalia of *Semium hirtum* Reut. By virtue of the arolia, this species is considered to belong to the Orthotylinae, but the female genitalia showed a closer affinity to those of the Phylinae. The male genitalia, likewise, suggest a closer affinity to those of the Phylinae and strongly indicate that the species should be included with the Phylinae. Similarly, the relationship of *Pilophorus* to the Orthotylinae may be of the same superficial nature as that of *Semium* to the Orthotylinae. The genitalia of *Pilophorus* resemble those of the Phylini and the Hallodapini, but the arolia are of the type found in the Orthotylinae rather than those in the Phylinae.

The Cylapinae appear to show no close relationship to the other groups studied, although the vesica resembles somewhat that found in the Dicyphini and certain species of the Halticini. The ductus seminis is flexible and the gonopore region is enclosed by a membranous, saclike process, often bearing a number of spiculi within (Figs. 138-141). The type of gonopore and the membranous sac found in *Cylapus* are very similar to those of *Orthocephalus* in the Halticini (Fig. 85), and the ductus seminis and the processes of the vesicae in *Fulvius* and *Peritropis* are similar to those found in the Dicyphini (Figs. 131-137). Since only a few species in the subfamily were studied, no further statement can be made on the subfamily relationships.

The Deraeocorinae are a specialized group in that the external appearance and the genitalia show some similarity to those of the Mirinae. The ductus seminis is flexible, and the tubular or bulbous processes bear spiculi similar to those of the Mirinae. The pattern of the gonopore region, however, distinguishes the group readily from the other subfamilies studied. The gonopore found in the Deraeocorinae may be the primitive type from which the gonopore of the Mirinae developed.

The Orthotylinae are also a highly specialized group. They appear to show no close relationship to the other groups except possibly through *Pilophorus* of the Pilophorini, which may be closely related to the Phylinae. The fact that the tribes of the Orthotylinae contain a heterogeneous mixture of species, some of which apparently belong to other subfamilies, makes it apparent that all the included species must be examined before the limitations of each tribe can be analysed.

In the Orthotylini the processes of the vesica, when present, are usually in the form of spiculi (Fig. 54). Those of the Halticini are considerably different and are usually in the form of membranous, saclike structures containing several short spiculi within. This difference may be a reliable criterion on which to base tribal distinctions of the subfamily. However, this will only be known when a large number of species now in the tribes are examined. The constant features found in the vesicae of both the Orthotylini and the Halticini are the horseshoe-shaped rim of the gonopore and the flexible ductus seminis. These suggest that the two

tribes are extremely closely related, and that a great amount of work is needed before the correct systematic positions of the species can be determined.

The characters of the vesica suggest that *Ceratocapsus* in the Orthotylini is related to *Halticus* in the Halticini, and to *Sericophanes* in the Pilophorini. Perhaps these three genera should be included in one tribe rather than in three separate tribes.

The tribe Pilophorini presents a very interesting and perplexing situation. A brief study of the tribe indicates that it contains an assemblage of species that belong to other subfamilies. With few exceptions, the species seem to show no relationship to one another or to other members of the Orthotylinae.

The vesicae of *Pilophorus* and *Alepidea* are sclerotized and very similar to each other and these genera are possibly closely related to *Cyrtopeltocoris*, but the three are considerably different from the typical members of the subfamily. In *Pilophorus* and *Alepidea* a slender, sclerotized process originates below the gonopore but this process is absent in *Cyrtopeltocoris*. These vesicae display a rather close resemblance to members of the Phylinae, as do the claspers and phallotheca. The female genitalia of *Pilophorus* likewise show little relationship to the Orthotylinae (Slater, 1950). The arolia, however, indicate a close similarity to the Orthotylinae.

The other genera studied in the Pilophorini are discussed under the subfamily heading.

The Mirinae represent a highly specialized group, as do the Orthotylinae, but, unlike the latter, appear to be a homogeneous group. The genitalia indicate that the tribes are very closely related, and that the subfamily is not closely related to the other subfamilies except possibly remotely to the Deraeocorinae as previously discussed.

The vesica of the Mirinae is distinctive. The rim of the gonopore is generally circular in outline, simulating a coiled spring, and appears to be a highly stable morphological structure of the subfamily. The processes of the vesica are membranous, bulbous, or tubular, and often have spiculi or spines of various lengths and shapes. The ductus seminis is cylindrical, and flexible at the base, but may be modified in shape and structure before the gonopore (Figs. 2, 3). This subapical region of the ductus seminis may be of value in distinguishing the tribes of the subfamily.

SUBFAMILY MIRINAE HAHN, 1831

This is the largest subfamily of the Miridae, and is composed of seven tribes containing approximately 255 genera represented in all the faunal regions of the world. The following five tribes were studied: Stenodemini China, Pithanini D. & S., Mirini Hahn, Resthenini Reut., and Herdoniini Dist.; 62 species in 38 genera were represented. No specimens were available from Mecistoscelini Reut. and Hyalopeplini Carv.

The distinguishing external characters of the subfamily are: the large and free arolia between the claws, the arolia usually spindle-shaped and divergent at apices, and the pronotal collar separated from the remainder of the pronotum by a groove, except in the Stenodemini and the Pithanini, in which the groove is absent or poorly defined.

The genitalia are distinctive. The most distinctive feature of the vesica is the rim of the gonopore. The circular or oval rim resembles a coiled spring. The processes of the vesica are lobate, occasionally having spiculi or spines. The phallotheca is generally a membranous sheath. The left clasper is gently or

sharply curved, and the sensory lobe varies considerably in size and form. The right clasper is generally slender, with a prominent apical process.

The genitalia studied, particularly the ductus seminis, suggest that the subfamily may be divided in two main groups, the Stenodemini and Pithanini forming one group and the Mirini, Resthenini, and Herdoniini the other. However, the genitalia are so similar in all the tribes as to suggest only one group.

The tribes Pithanini and Stenodemini can usually be separated by external appearance. In the Pithanini, the species are antlike and have rounded lateral margins on the pronotum, reduced hemelytra, and other external characters that accompany such specialization. The Stenodemini, on the other hand, generally have a lateral carina on the pronotum and long hemelytra. However, the genus *Collaria* Prov., now placed in the Stenodemini, lacks the lateral carina on the pronotum. The genera *Leptopterna* Fieb., *Litomiris* Slater, and *Teratocoris* Fieb., although placed in the Stenodemini, have both long and short hemelytra. The basic structures of the genitalia, especially the vesica, suggest that the two tribes are extremely closely related, and show no concrete evidence to warrant their separation.

The two tribes are also very similar in ecology. The host plants for a large number of species of both were recorded as grasses and sedges (Knight, 1941).

A similar situation is suggested by the group comprising the Mirini, Resthenini, and Herdoniini. The genitalia appeared to show no significant differences in structure to warrant separation into three tribes. Species of the Herdoniini are generally antlike, but the genitalia of *Paraxenetus* Reut., *Dacerla* Sign., and *Paradacerla* Carv. and Using. are very similar to those of the Mirini and the Resthenini.

Species of the Resthenini have a greatly reduced osteolar peritreme, but the genitalia of *Prepops* Reut. studied are very similar to those of the other two tribes. The female genitalia investigated by Slater (1950) also showed insufficient differences for a separate tribe. If the present three tribes come to be regarded as a single one, the name Mirini Hahn will have priority.

Tribe Stenodemini China, 1943

The species of this tribe are characterized by the slender form, long legs, and long and slender antennal segments; the scarcely overlapping tarsal segments, very flexible at the joints, the first tarsal segment longer than second; the lateral carina on the pronotum; and the incomplete pronotal collar.

Approximately 26 genera are included in the tribe. Only 14 species from eight genera were examined. The genital structures show characters typical of the group and provide reliable differences for determining species. The vesica is very similar to that in the Pithanini, but is readily separated from those of the other tribes of the subfamily by the slender and cylindrical ductus seminis. The processes of the vesica are tubular or bulbous, with or without spiculi. The phallotheca is a simple, membranous sheath.

Leptopterna Fieber, 1858

Distinguished by lateral carina on pronotum; long, black pubescence on first antennal segment; and erect pubescence on body and hemelytra.

One species, *L. dolabratus* (L.), formerly known as *Miris dolabratus*, was studied.

***Leptopterna dolabratus* (Linnaeus, 1758).** Figs. 1-3

Left clasper gently curved; sensory lobe moderate in size; shaft pointed at

apex. Right clasper constricted at middle, thicker apically than at base; short process at apex.

Membranous processes of vesica poorly defined; two spiculi, very long and slender; ductus seminis cylindrical.

Specimen illustrated: Ames, Iowa; June 18, 1928; H. H. Knight.

Megaloceraea Fieber, 1858

Distinguished by lateral carina on pronotum; very minute punctures on pronotum; very long first antennal segment with very short, black pubescence; and longitudinal groove between eyes.

One species, *M. recticornis* (Geof.), was studied. The genitalia appear to show a distinct generic entity with a possible relationship to *Leptopterna*.

***Megaloceraea recticornis* (Geoffroy, 1785).** Fig. 4

Claspers very similar to those of *Leptopterna dolabratus* but more slender; sensory lobe of left clasper apparently absent; shaft with a curved process at apex. Right clasper with a prominent apical process.

Lobes of vesica bulbous and spinulate; two lobes with a long spiculum each; ductus seminis cylindrical.

Specimen illustrated: Ames, Iowa; June 20, 1925; H. H. Knight.

Litomiris Slater, 1956

This genus now contains a number of North American species formerly considered under *Megaloceraea* (Slater, 1956).

Distinguished by lateral carina on pronotum; punctate pronotum and scutellum; and long, slender first antennal segment, longer than head width across the eyes.

Two species, *L. debilis* (Uhl.) and *curta* (Kngt.), were studied. The genitalia indicate that the species are not congeneric with those of *Megaloceraea*.

***Litomiris debilis* (Uhler, 1872).** Fig. 5

Left clasper evenly curved; sensory lobe more prominent than in *Megaloceraea recticornis*; shaft with two short teeth before apex. Right clasper constricted and angled at middle; basal half slender, distal half greatly enlarged; short pointed process at apex.

Lobes of vesica tubular and spinulate; one lobe slender and pointed at apex; spiculum corkscrew-shaped, margin serrate; other sclerite flattened; ductus seminis as in *M. recticornis*.

Specimen illustrated: Willow Creek, Mont., June 18, 1921; Wm. Cook.

***Litomiris curta* (Knight, 1928).** Fig. 6

Claspers very similar to those of *debilis*; right clasper with an elongate apical process.

Vesica similar in form to that of *debilis*, but with marked differences in the shape of the lobes.

Specimen illustrated: Yellowstone National Park, Wyo.; Aug. 8, 1927; H. H. Knight.

Stenodema Laporte, 1832

Distinguished by lateral carina on pronotum; and long, dense pubescence on first antennal segment.

Three species, *S. virens* (L.), *vicinum* (Prov.) and *trispinosum* Reut., were examined. It is doubtful whether *S. virens* (L.) occurs in North America. The Nearctic species of *Stenodema* determined by several workers (Horvath, 1908; Knight, 1922) as *virens* (L.) and *vicinum* (Prov.) appear to be conspecific, and henceforth should be designated as *vicinum*. Specimens of *virens* are slightly

larger in size, and the genitalia differ markedly, the vesica of *virens* being larger than and having tubular lobes not evident in that of *vicinum*.

***Stenodema virens* (Linnaeus, 1767).** Fig. 7

Left clasper sharply angled; sensory lobe large; shaft slender, with recurved hook at apex. Right clasper as in *Leptopterna dolabratus* but more slender; apical process bifid.

Vesica entirely membranous; lobes spinulate; two distinctive elongate-tubular processes directed towards base; ductus seminis cylindrical.

Specimen illustrated: "Thuring. German."

***Stenodema vicinum* (Provancher, 1872).** Fig. 8

Claspers similar to those of *virens* in general form and appearance; right clasper slightly thicker than that of *virens*, apical process more prominent.

Vesica membranous and spinulate as in *virens*, but considerably different in detail.

Specimen illustrated: Ledyard, Iowa; Aug. 7, 1928; G. O. Hendrickson.

***Stenodema trispinosum* Reuter, 1904.** Fig. 9

Claspers similar in general aspect to those of *vicinum*, but smaller; right clasper with a simple apical process.

Vesica smaller and less detailed than that of *vicinum*; apparently bilobed; lobes with a series of short barbules.

Specimen illustrated: Moscow, Idaho; May 7, 1936; T. A. Brindley.

Trigonotylus Fieber, 1858

Distinguished by lateral carina on pronotum; minute punctures on pronotum; protruding frons; and distinct longitudinal groove between eyes.

Two species, *T. ruficornis* (Geof.) and *tarsalis* (Reut.) were examined. The genitalia show pronounced specific differences, and suggest a distant relationship to *Stenodema* and *Dolichomiris*.

***Trigonotylus ruficornis* (Geoffroy, 1785).** Fig. 10

Left clasper slender, and sharply angled; shaft pointed at apex. Right clasper slender at base, somewhat enlarged beyond the middle; short horizontal process at apex.

Lobes of vesica smooth, supporting one spiculum; ductus seminis typical of Stenodemini.

Specimen illustrated: Batavia, N.Y.; June 30, 1914; H. H. Knight.

***Trigonotylus tarsalis* (Reuter, 1876).** Fig. 11

Left clasper slender as in *ruficornis*, but slightly larger and more acutely angled. Right clasper similar to that of *Stenodema trispinosum*, but glabrous.

Vesica entirely membranous, the lobes spinulate; ductus seminis as in *Megaloceraea recticornis*.

Specimen illustrated: St. Anthony Pk., Minn.; July 6, 1921; H. H. Knight.

Dolichomiris Reuter, 1882

Distinguished by lateral carina on pronotum; long first antennal segment with long, semi-erect pubescence; protruding frons; and longitudinal groove between eyes.

One species, *D. linearis* Reut., was examined. The genitalia show characteristics typical of the Stenodemini.

***Dolichomiris linearis* Reuter,1882.** Fig. 12

Left clasper slender and evenly curved; recurved process at apex. Right clasper as in *Trigonotylus tarsalis*, but more slender.

Lobes of vesica smooth, with two spiculi; one spiculum with a serrate margin; ductus seminis as in *Trigonotylus*.

Specimen illustrated: Likely, Florida; July 24, 1934; P. McKinstry.

Teratocoris Fieber, 1858

Distinguished by lateral carina on pronotum; very fine punctures on pronotum; short head; and long first antennal segment, thicker basally than at apex.

Two species, *T. discolor* Uhl. and *herbaticus* Uhl., were studied. The structures show pronounced specific differences, and display characters typical of the Stenodemini.

***Teratocoris discolor* Uhler, 1887.** Fig. 13

Left clasper slender, evenly curved. Right clasper narrow at base; rounded distally, with a short subapical process.

Lobes of vesica membranous or partly sclerotized; spiculum short; ductus seminis as in *Trigonotylus*.

Specimen illustrated: Saskatoon, Sask.; Sept. 19, 1950; A. R. Brooks.

***Teratocoris herbaticus* Uhler, 1887.** Fig. 14

Left clasper similar to that of *discolor*, but larger. Right clasper more slender than that of *discolor*; subapical process directed towards apex.

Lobes of vesica more numerous than those of *discolor*, with two slender spinulate processes, and a short spiculum; ductus seminis typical of Stenodemini.

Specimen illustrated: Bradore Bay, Que.; July 19, 1929; W. J. Brown.

Collaria Provancher, 1872

Distinguished by rounded lateral margin on pronotum; strongly exserted head; and location of eyes, far removed from pronotum.

Two species, *C. meilleurii* Prov. and *oculatus* Reut., were studied, the former being illustrated. The genitalia of the two species are very similar in form, and show characters typical of the Stenodemini.

***Collaria meilleurii* Provancher, 1872.** Fig. 15

Left clasper similar to that of *Dolichomiris linearis* but larger and thicker. Right clasper relatively small and short for size of species; short vertical process at apex.

Vesica membranous, with two distinctive tubular lobes; another lobe with a series of short spines; ductus seminis as in *Stenodema*.

Specimen illustrated: St. Anthony Pk., Minn.; July 1, 1921; A. Hertig.

Tribe Pithanini Douglas and Scott, 1865

The species of Pithanini are characterized by the slender form, long legs, and long and slender antennal segments; the scarcely overlapping tarsal segments, very flexible at the joints, the first tarsal segment longer than second; the rounded lateral margin on the pronotum; and swollen callus; and the vestigial cuneus and membrane.

Only three genera, *Myrmecoris* Gorski, *Pithanus* Fieb. and *Mimoceps* Uhl., are included in this tribe on the basis of their myrmecomorphic form. Species of *Pithanus* and *Mimoceps* were studied, and the genitalia are similar to those of *Myrmecoris* sp. as illustrated by Kullenberg (1947a).

The genitalia of the Pithanini show characters similar to those of the Stenodemini, and suggest no significant differences in the basic pattern to support the separation of these two tribes. If the two tribes are combined, then Pithanini will have priority over Stenodemini.

Pithanus Fieber, 1858

Recognized by rounded lateral margin on pronotum; swollen pronotum at middle; reduced hemelytra; and short and stout first antennal segment.

One species, *P. maerkelii* (H.-S.), was examined. The genitalia display an affinity to members of the Stenodemini.

***Pithanus maerkelii* (Herrich-Schaeffer, 1839).** Fig. 16

Left clasper sharply angled; sensory lobe moderate in size; shaft relatively long and uniformly slender. Right clasper small; curved process at apex.

Vesica membranous, the lobes smooth; ductus seminis typical of Stenodemini.

Specimen illustrated: "Europe".

Mimoceps Uhler, 1890

Brachypterous and macropterous forms are known. The hemelytra show no demarcation between the corium and the membrane.

Distinguished by rounded lateral margin on pronotum; and swollen pronotum at middle.

One species, *M. gracilis* Uhl., was studied. The claspers and the vesica suggest a close relationship to *Pithanus* and *Teratocoris*.

***Mimoceps gracilis* Uhler, 1890.** Fig. 17

Left clasper sharply curved; sensory lobe prominent; shaft with a short tubercle before apex. Right clasper similar to that of *Teratocoris herbaticus*, but distal portion enlarged into a knob.

Vesica similar to that of *Pithanus*; ductus seminis similar to that of *Teratocoris*.

Specimen illustrated: Hamburg, N.Y.; June 6, 1891; F. P. Van Duzee.

Tribe Mirini Hahn, 1831

The species of this tribe are characterized by the oval shape and robust size; the distinct pronotal collar; and the greatly overlapping tarsal segments, first tarsal segment usually shorter than second.

Approximately 175 genera are included in the tribe. Only 41 species from 24 genera were examined. The genitalia are similar in basic pattern to those of other tribes of the Mirinae. The vesica differs from those of the Stenodemini and the Pithanini in the subapical expansion of the ductus seminis. The processes of the vesica are useful in determining species, and occasionally suggest very close generic relationships. The rim of the gonopore is a subfamily character that is very useful in placing species in the Mirinae that have undergone extreme specialization and are externally unlike their relatives. The phallotheca is a simple, partially sclerotized sheath.

Tropidosteptes Uhler, 1878

The genus *Neoborus* Dist., was placed in synonymy under *Tropidosteptes* by Carvalho (1954).

Distinguished by punctures between and in front of calli on pronotum, often extending to the head; and the lateral carina on pronotum.

Two species, *T. cardinalis* Uhl. and *rufusculus* (Kngt.), were studied. The genitalia of the species are very similar, and show only slight specific differences. The genera *Tropidosteptes*, *Xenoborus*, and *Neoborella* also appear to be congeneric. The female genitalia of the above genera, except *Neoborella*, which was not studied, also suggest that a single generic component is involved (Slater, 1950). Also, they may be remotely related to species of *Liocoris* (Kelton, 1955).

***Tropidosteptes cardinalis* Uhler, 1878.** Fig. 18

Left clasper sharply curved; sensory lobe very prominent, apex rounded; shaft

with a blunt point at apex. Right clasper broad at middle, prominent narrow process at apex.

Lobes of vesica smooth; spiculum short and slender; sclerite spinose and curved; ductus seminis slightly expanded before apex; trough beyond rim of gonopore short. Phallotheca with a small rounded flange near apex.

Specimen illustrated: Batavia, N.Y.; June 24, 1915; H. H. Knight.

***Tropidosteptes rufusculus* (Knight, 1923).** Fig. 19

Claspers similar to those of *cardinalis*, but smaller; shaft of left clasper pointed at apex, short tooth before apex. Right clasper broader distally than at base; apical process truncate.

Vesica as in *cardinalis*, but smaller and slightly different in detail. Phallotheca as in *cardinalis*.

Specimen illustrated: Wyoming Co., N.Y.; June 16, 1915; H. H. Knight.

Xenoborus Reuter, 1908

Distinguished by punctate pronotum as in *Tropidosteptes*; striolate frons; and rounded lateral margin on pronotum.

Two species, *X. plagifer* (Reut.) and *commissuralis* Reut., were studied. The genitalia suggest a very close relationship to *Tropidosteptes* and *Neoborella*, and that the three are congeneric.

***Xenoborus plagifer* (Reuter, 1909).** Fig. 20.

Left clasper larger than that of *Tropidosteptes cardinalis;* shaft elongate, sharp point at apex. Right clasper short and broad, with short tooth at apex.

Vesica very similar to that of *T. rufusculus*, but larger. Phallotheca as in *rufusculus*, but flange narrower and longer.

Specimen illustrated: Batavia, N.Y.; Aug. 12, 1916; H. H. Knight.

***Xenoborus commissuralis* Reuter, 1908.** Fig. 21

Claspers similar to those of *plagifer*, but shaft of left clasper less angular and apical process truncate.

Vesica similar to that of *plagifer*, but more sclerotized and larger; ductus seminis as in *T. cardinalis*. Phallotheca as in *cardinalis*.

Specimen illustrated: Strawberry Point, Iowa; July 27-29, 1927; Harris and Johnston.

Neoborella Knight, 1925

Distinguished by punctate pronotum as in *Tropidosteptes*, and striolate frons and rounded lateral margin on pronotum as in *Xenoborus*. Separated from *Xenoborus* by longer second antennal segment.

One species, *N. tumida* Kngt., was studied. The relationship of the species was discussed above. If the above genera are combined into one, then *Tropidosteptes* will have priority.

***Neoborella tumida* Knight, 1925.** Fig. 22

Left clasper similar to that of *Tropidosteptes rufusculus;* apical process of shaft pointed. Right clasper with a pointed apical process.

Vesica as in *rufusculus*, but spinose sclerite greatly reduced in size; ductus seminis as in *T. cardinalis*. Phallotheca similar to that of *cardinalis*.

Specimen illustrated: Mt. Lemon, Ariz.; Santa Cat. Mts.; July 27, 1917; Alt. 9000 ft.; H. H. Knight.

Neurocolpus Reuter, 1876

Distinguished by thick first antennal segment, with numerous flattened hairs.

One species, *N. nubilus* (Say), was studied. The genitalia are similar in

basic pattern to those of *Taedia* and *Lampethusa*, and appear to be congeneric. Slater (1950), also investigated the female genitalia of *Poeas* Dist., and concluded that the four genera represent a single generic type. The vesica also appears to be similar to that of *Irbisia*, and possibly *Stittocapsus*.

***Neurocolpus nubilus* (Say, 1832).** Fig. 23

Left clasper sharply curved; sensory lobe very prominent, rounded at apex. Right clasper flattened, apex rounded.

Vesica trilobed, larger lobe with a series of spines at apex; spiculum flattened, and supported by an adjacent sclerotized structure; ductus seminis greatly expanded; rim of gonopore spherical. Phallotheca with a recurved dorsal hook at apex.

Specimen illustrated: Batavia, N.Y.; July 27, 1913; H. H. Knight.

Taedia Distant, 1883

The genus *Paracalocoris* Dist. was synonymized with *Taedia* by Carvalho (1954).

Recognized by long, black hairs on first antennal segment; and subexcavated black spot behind each callus on pronotum.

Two species, *T. scrupeus* (Say) and *salicis* (Kngt.), were examined. The genitalia are very similar to those of *Neurocolpus* and *Lampethusa*, and suggest a congeneric relationship. Slight affinity is suggested to *Irbisia*, and more remote affinity to *Stittocapsus*.

***Taedia scrupeus* (Say, 1832).** Fig. 24

Claspers similar to those of *Neurocolpus nubilus;* sensory lobe of left clasper pointed at apex. Right clasper with a short subapical tubercle.

Vesica similar to that of *nubilus;* spiculum very long, accessory structure membranous beyond the middle to apex; gonopore and ductus seminis as in *nubilus*. Phallotheca as in *nubilus*.

Specimen illustrated: Portage, N.Y.; June 27, 1915; H. H. Knight.

***Taedia salicis* (Knight, 1926).** Fig. 25

Claspers very similar in form to those of *N. nubilus*.

Vesica very similar to that of *T. scrupeus*. Phallotheca with a recurved tip.

Specimen illustrated: Ramsey Co., Minn.; July 18, 1922; H. H. Knight.

Lampethusa Distant, 1884

Distinguished by flattened first antennal segment; and subexcavated black spot behind each callus on pronotum.

One species, *L. anatina* Dist., was examined. The genitalia are similar to those of *Neurocolpus* and *Taedia* mentioned above. In the event the genera are combined *Neurocolpus* Reut. will have priority.

***Lampethusa anatina* Distant, 1884.** Fig. 26

Claspers and vesica very similar to those of *Neurocolpus nubilus* with some modifications; spiculum very slender and reduced in size. Phallotheca without a recurved tip.

Specimen illustrated: Chiriqui, Panama; Dec. 1948; N. L. H. Krauss.

Irbisia Reuter, 1879

Thyrillus Uhl., 1894 was synonymized with *Irbisia* by Carvalho (1952); this action was supported by Slater (1950), and is further supported by consideration of the male genitalia of the species studied.

Distinguished by black colour; rugose pronotum; and long, dense pubescence on head, pronotum and hemelytra.

The two species studied were *I. sericans* (Stål) and *pacificus* (Uhl.). The genitalia differ in a number of details, but indicate that the species are congeneric.

***Irbisia sericans* (Stål, 1858).** Fig. 27

Left clasper acutely angled; sensory lobe moderately developed with numerous bristles at apex; shaft truncate at apex. Right clasper subcylindrical; two short processes at apex.

Vesica membranous, the lobes smooth; sclerotized process furcate, the margins serrate; ductus seminis expanded subapically.

Specimen illustrated: Katmai, Alaska; Aug. 10, 1917; J. A. Hine.

***Irbisia pacificus* (Uhler, 1872).** Fig. 28

Left clasper evenly curved; sensory lobe smaller than that of *sericans;* shaft with a recurved, pointed process at apex. Right clasper slender, cylindrical; short pointed process at apex.

Vesica similar to that of *sericans*, but lobes larger, and serrations on sclerotized process more pronounced.

Specimen illustrated: Santa Maria, Calif.; May 1, 1923; C. E. Hendrickson.

Adelphocoris Reuter, 1896

Superficially resembles *Stittocapsus* Kngt., but separated from that genus by longer rostrum, which extends beyond hind coxa; and shorter and broader cuneus.

Two species, *A. lineolatus* (Goeze) and *rapidus* (Say), were examined, the former being illustrated. The characteristic genitalia indicate a distinct generic group.

***Adelphocoris lineolatus* (Goeze).** Fig. 29

Left clasper slender, broadly curved; shaft with a short flat beak at apex. Right clasper slender; short curved process at apex.

Vesica with spinulate lobes; spiculum short and curved; sclerite large and deeply serrate; ductus seminis as in *Irbisia pacificus.*

Specimen illustrated: Harpenden, England; Aug. 28, 1948; T. R. E. Southwood.

Stittocapsus Knight, 1942

Distinguished by long, narrow cuneus, 2½ times longer than wide; immarginate vertex on head; shallow, longitudinal groove between eyes; and short rostrum extending to middle coxa.

The single species of the genus, *S. franseriae* Kngt., was studied. The processes of the vesica are poorly differentiated, except for the large and spinose spiculum. The genitalia suggest no close relationship to the other genera studied.

***Stittocapsus franseriae* Knight, 1942.** Fig. 30

Left clasper curved; sensory lobe small, with several stiff, short hairs; distal portion of shaft narrow, short beak at apex. Right clasper relatively slender; short vertical process at apex.

Vesica tubular in outline; membranous lobes small and few in number; spiculum clavate and spinose apically; ductus seminis cylindrical.

Specimen illustrated: Mohawk, Ariz.; April 6, 1937; L. L. Stitt.

Calocoris Fieber, 1858

Distinguished by immarginate vertex on head; and short, black and golden pubescence on hemelytra.

One species, *C. norvegicus* (Gmel.), was examined. The genitalia appear to show no close affinity to the other genera studied.

***Calocoris norvegicus* (Gmelin, 1788).** Fig. 31

Left clasper broadly curved and uniformly slender; sensory lobe small; shaft dorsoventrally flattened near apex, short compressed process at apex. Right clasper uniformly slender; curved process at apex.

Vesica spiculate rather than lobate; sclerotized process spinose; ductus seminis cylindrical, somewhat constricted before apex.

Specimen illustrated: Vancouver, B.C.; July 4, 1950; B. P. Beirne.

***Polymerus* Westwood, 1839**

Distinguished by silky or woolly pubescence on body and hemelytra.

Two representatives, *P. chrysopsis* Kngt. and *unifaciatus lateralis* (Hahn), were studied, the former being illustrated. The vesica is very complicated in detail, having membranous lobes, spiculi, and spinose processes. The right clasper is greatly reduced in size. These appear to indicate a distinct generic group.

***Polymerus chrysopsis* Knight, 1925.** Fig. 32

Left clasper slender, glabrous, knobbed near base; sensory lobe poorly developed; shaft pointed at apex. Right clasper greatly reduced in size; ovate; short tubercle at apex.

Vesica with membranous lobes, spiculi, and spinose processes; ductus seminis cylindrical. Phallotheca with a sclerotized subapical tubercle.

Specimen illustrated: Jordan, Minn.; Sand Area; July 13, 1923; H. H. Knight.

***Allorhinocoris* Reuter, 1876**

Distinguished by long and slender antennal segments, first segment longer than length of pronotum; longitudinal groove between eyes; lateral carina on pronotum; and short, black bristles on hemelytra.

One species, *A. flavus* Sahlbg., was studied. The genitalia show no close relationship to the other genera studied.

***Allorhinocoris flavus* Sahlberg, 1878.** Fig. 33

Left clasper gently curved; sensory lobe moderately developed, conical, with short tubercles at bases of hairs; shaft with a sharp beak at apex. Right clasper slender; short oblique process at apex.

Vesica simple; processes poorly differentiated and small; one lobe spinulate; ductus seminis constricted subapically. Phallotheca conical; apex recurved into a short hook.

Specimen illustrated: Rainier Natl. For., Wash.; Aug. 10, 1932; Lodge Pole Camp; A. R. Rolfs.

***Stenotus* Jakovlev, 1877**

Distinguished by elongate, narrow form; the immarginate vertex on head; and first segment of hind tarsus longer than third.

Two species, *S. binotatus* (F.) and *nigroquadristriatus* (Kirk.), were studied. The genitalia appear to suggest no close relationship to the other genera studied.

***Stenotus binotatus* (Fabricius, 1794).** Fig. 34

Left clasper sharply curved; sensory lobe well developed, rounded; shaft somewhat compressed, short beak at apex. Right clasper broad; process at apex beaklike.

Vesica membranous; lobes bulbous, spinulate; ductus seminis expanded subapically.

Specimen illustrated: Ames, Iowa; June 24, 1930; H. H. Knight.

***Stenotus nigroquadristriatus* (Kirkaldy, 1902).** Fig. 35

Left clasper broadly curved; sensory lobe large, conical; shaft irregular, distal half compressed; apical process flattened and rounded. Right clasper expanded subapically; short process at apex.

Vesica membranous; lobes smooth, except for the spiculate apex of one lobe; ductus seminis as in *binotatus*.

Specimen illustrated: Malvern E.; Union South Africa; Feb. 1, 1950; A. L. Capener.

Dichrooscytus Fieber, 1858

Distinguished by broad head and wide frons; and sloping eyes, practically in contact with the anterior angles of pronotum.

Two species, *D. rufipennis* (Fall.) and *suspectus* Reut., were studied, the latter being illustrated. The genitalia suggest a distinct generic group, with no apparent relationship to the other genera studied. The vesicae show pronounced specific differences.

***Dichrooscytus suspectus* Reuter, 1909.** Fig. 36

Left clasper gently curved; sensory lobe large, rectangular in shape; shaft with a short notched beak at apex. Right clasper suboval; apical process thick at base.

Vesica membranous; lobes spinulate, with a number of sclerotized areas bearing heavy spines; ductus seminis moderately expanded, with expansion constricted subapically.

Specimen illustrated: Mt. Lyall, Que.; 1500 ft.; Aug. 6, 1933; W. J. Brown.

Phytocoris Fallén, 1814

Distinguished by long and flattened hind femur, extending beyond tip of abdomen; enlarged lorum; and long first antennal segment, with a number of long hairs.

Seven species of this large genus were studied, and two, *P. pallidicornis* Reut. and *tibialis* Reut., are illustrated. The genitalia are distinctive, the vesica has large toothlike spines on the lobes, or large, serrate sclerites (Knight, 1941).

***Phytocoris pallidicornis* Reuter, 1876.** Fig. 37

Left clasper sharply curved; sensory lobe moderately developed; shaft slender, expanded and dorsoventrally flattened before apex; short point at apex. Right clasper very slender; short process at apex.

Vesica membranous and lobate; one lobe with a row of heavy spines; ductus seminis subapically expanded, with expansion constricted at middle.

Specimen illustrated: Esterhazy, Sask.; Aug. 14, 1954; Brooks and Wallis.

***Phytocoris tibialis* Reuter, 1876.** Fig. 38

Left clasper irregularly curved; sensory lobe moderately developed; shaft relatively slender and dorsoventrally compressed before apex; small tubercle and a row of spines at middle; apex pointed. Right clasper long and slender, with a row of spines before apex; apex truncate and slightly notched.

Vesica membranous and lobate; one lobe with a row of heavy spines; another with dense and short bristles at apex; ductus seminis expanded, with expansion constricted before apex.

Specimen illustrated: Batavia, N.Y.; Aug. 5, 1915; H. H. Knight.

Platylygus Van Duzee, 1915

Distinguished by large size; translucent and almost glabrous hemelytra; and long rostrum, extending beyond hind coxa.

One species, *P. grandis* Kngt., was studied. The genitalia are distinctive, and appear to show no close relationship to the other genera studied. However, remote relationship may exist to *Phytocoris*.

***Platylygus grandis* Knight, 1918.** Fig. 39

Left claspers sharply curved; sensory lobe large, pointed at apex; shaft with a short subapical flange and a beak at apex. Right clasper rectangular in outline; long curving process at apex.

Vesica with the large lobe margined with curved spines; ductus seminis expanded subapically, with expansion constricted near middle.

Specimen illustrated: Mt. Lemon, Ariz.; Santa Cat. Mts.; July 26, 1917; Alt. 9000 ft.; H. H. Knight.

Coccobaphes Uhler, 1878

Distinguished by large size; red colour; and black second antennal segment, densely clothed with short pubescence.

The single species of the genus, *C. sanguinarius* Uhl., was studied. The vesica is distinctive, with knoblike, spined processes arising from the membranous lobes.

***Coccobaphes sanguinarius* Uhler, 1878.** Fig. 40

Left clasper evenly curved; sensory lobe prominent, rounded and minutely serrate; shaft with a curved, flattened beak at apex. Right clasper relatively slender; terminal process flattened and curved.

Vesica membranous, characterized by four spinose knobs; two apical knobs connected by a row of spines; ductus seminis expanded subapically, with expansion constricted at middle. Phallotheca with a narrow lateral flange.

Specimen illustrated: Rock City, N.Y.; Cattaraugus Co.; July 4, 1915; H. H. Knight.

Capsus Fabricius, 1803

Distinguished by black colour; clavate second antennal segment; and tumid jugum.

One species, *C. ater* (L.), was studied. The genitalia show no close relationship to the other genera studied.

***Capsus ater* (Linnaeus, 1758).** Fig. 41

Left clasper sharply angled; sensory lobe prominent; apex of shaft with a thick, curved process. Right clasper cylindrical, median side with a subapical concavity; broad oblique process at apex.

Vesica subsymmetrically Y-shaped; lobes spinulate; spiculum very long and slender; ductus seminis expanded subapically, with expansion constricted near middle.

Specimen illustrated: Batavia, N.Y.; June 16, 1915; H. H. Knight.

Horcias Distant, 1884

Distinguished by glabrous and shiny appearance of pronotum and hemelytra; immarginate vertex on head; and prominent lorum.

Two species, *H. dislocatus* (Say) and *sexmaculatus* (Barb.), were studied. The genitalia suggest that either there is a great deal of variation in the genus, or that *dislocatus* is not congeneric with *sexmaculatus*. The flattened spines in *sexmaculatus* and other striking differences in the details of the vesica suggest independent generic identity.

***Horcias dislocatus* (Say, 1832).** Fig. 42

Left clasper evenly curved; sensory lobe greatly developed, rounded at apex; apex of shaft with a short process directed ventrally. Right clasper broad; short oblique process at apex.

Vesica highly lobate, the lobes spinulate and variously shaped; spiculum short and slender, with a row of short bristles at base; ductus seminis expanded subapically, with expansion constricted at middle.

Specimen illustrated: Turtle Mts., Man.; July 18, 1953; Brooks and Kelton.

***Horcias sexmaculatus* (Barber, 1906).** Fig. 43

Left clasper evenly curved; sensory lobe greatly developed, conical, margin covered with numerous stiff bristles; shaft somewhat dorsoventrally flattened, with a short, pointed process at apex. Right clasper subcylindrical; protrusion at base conical; apical process curved and slender.

Vesica partly sclerotized; three lobes membranous, one covered with numerous flattened spines; spiculi slender and curved; spinose process tubular; ductus seminis expanded subapically, with expansion slightly constricted at middle.

Specimen illustrated: New Braunfels, Tex.; June 22, 1917; H. H. Knight.

Ganocapsus Van Duzee, 1912

Distinguished by glabrous and shiny appearance of pronotum; and long, black first antennal segment, its length equal to width of head across the eyes.

One species, *G. filiformis* Van D., was studied. The genitalia indicate a distinct generic group, but remote relationship may exist to *Horcias sexmaculatus*. The long, stiff bristles of *filiformis* may be comparable to the flat spines of *H. sexmaculatus*.

***Ganocapsus filiformis* Van Duzee, 1912.** Fig. 44

Left clasper sharply curved; sensory lobe very prominent, conical; shaft near apex dorsoventrally compressed, short process at apex. Right clasper broad, oblique and conical process at apex.

Vesica with membranous processes spinose at apices; one lobe with a number of long stiff bristles; spiculi short and curved; ductus seminis expanded subapically, with expansion constricted at middle.

Specimen illustrated: Tucson, Ariz.; Aug. 29, 1925; Alt. 2400 ft.; A. A. Nichol.

Poecilocapsus Reuter, 1878

Distinguished by glabrous, shiny appearance of pronotum and hemelytra; and short rostrum reaching slightly beyond first coxa.

One species, *P. lineatus* (F.), was studied. The genitalia appear to show no close relationship to the other genera studied.

***Poecilocapsus lineatus* (Fabricius, 1798).** Fig. 45

Left clasper sharply curved, relatively uniform in thickness; sensory lobe small, conical; shaft with a curved pointed process at apex. Right clasper with two short tubercles near base; long curved process at apex.

Lobes of vesica spinulate, variously shaped; spiculum long and slender; ductus seminis expanded subapically, with expansion constricted at middle.

Specimen illustrated: Ithaca, N.Y.; June 14, 1914; H. H. Knight.

Lygidea Reuter, 1879

Distinguished by spherical eyes, only slightly emarginate on inner side, and not extending below the ventral rim of antennal fossa; thick second antennal segment; and prominent depression behind each callus.

Two species, *L. viburni* Kngt. and *salicis* Kngt., were studied, the former being illustrated. The genitalia suggest a distinct generic group.

***Lygidea viburni* Knight, 1923.** Fig. 46

Left clasper sharply curved; sensory lobe prominent, rounded; apical portion of shaft flattened, short process directed ventrally at apex. Right clasper slender, with a small lobe near base; apical process flattened, beaklike.

Vesica membranous, trilobed; lobes tubular, some with curved spines at apices; ductus seminis expanded subapically, with expansion constricted at middle. Phallotheca with a narrow lateral flange before apex.

Specimen illustrated: Batavia, N.Y.; June 24, 1915; H. H. Knight.

Garganus Stål, 1862

Distinguished by narrow elongate form; immarginate vertex on head; black, and spindle-shaped second antennal segment; and prominent lorum.

One species, *G. fusiformis* (Say), was studied. The genitalia are distinctive. The vesica is membranous and relatively simple in detail, and suggests an affinity to *Lygidea.*

***Garganus fusiformis* (Say, 1832).** Fig. 47

Claspers relatively small in size; left clasper gently curved, uniform in thickness; sensory lobe small; apex of shaft pointed. Right clasper subovoid; several short tubercles at middle; apical process slender, set at an oblique angle.

Lobes of vesica tubular and smooth; ductus seminis as in *Lygidea.*

Specimen illustrated: Chatham, Ont.; July 24, 1928; A. B. Baird.

Creontiades Distant, 1883

Distinguished by striolate frons; immarginate vertex on head; longitudinal sulcus between eyes; and long third antennal segment, longer than width of pronotum at base.

Two species, *C. debilis* Van D. and *rubrinervis* (Stål), were studied, the former being illustrated. The genitalia are distinctive, and very similar in the two species. The genital structures are relatively small for the size of species, and the vesica is highly symmetrical in form and detail. The narrow rim of the gonopore, and the shape of the ductus seminis suggest an affinity to *Adelphocoris.*

***Creontiades debilis* Van Duzee, 1915.** Fig. 48

Claspers very slender and uniform in thickness; left clasper gently curved; sensory lobe undeveloped; shaft slightly expanded before apex, apical process short and flattened. Right clasper slender; short bifid process at apex.

Vesica entirely membranous, symmetrical; lobes conical and spinulate; ductus seminis expanded subapically; rim of gonopore very narrow, the opening wide.

Specimen illustrated: Biloxi, Miss.; June 14, 1917; H. H. Knight.

Tribe Resthenini Reuter, 1905

The species of this tribe are recognized by the characters listed for the Mirini, and the following: the greatly reduced and almost invisible osteolar peritreme; the numerous papillalike structures on the pronotum and the hemelytra, giving the species a velvety appearance; and the black colour, with red or yellow markings.

Approximately 14 genera are included in the tribe. Two species of *Prepops* Reut. were studied. The genitalia are similar to those of the Mirini and the Herdoniini, and show structural characters typical of the subfamily. The external differences appear to be no more pronounced than between genera of the Mirini, and the genitalia suggest no significant differences in the basic pattern to support the present distinction between tribes.

Prepops Reuter, 1905

Opistheuria Reut., 1907, was synonymized with *Platytylellus* Reut., 1907 by Carvalho (1952), and later (1954) he synonymized the latter with *Prepops;* this action was suggested by Slater (1950), and is further supported by consideration of the male genitalia of the species of these genera.

Distinguished by smooth and almost glabrous pronotum; elongate form; first antennal segment longer than width of vertex; and second antennal segment more slender than first.

Two representatives, *P. clandestina ventralis* (Kngt.) and *insitivus* (Say), were studied. The genitalia appear to be similar in form and structure to those observed in the Mirini and the Herdoniini.

***Prepops clandestina ventralis* (Knight, 1918).** Fig. 49

Left clasper gently curved; sensory lobe small; shaft narrowing to a point at apex. Right clasper gently curved, uniform in thickness; short tooth at apex.

Membranous lobes of vesica spinulate and slender; sclerotized processes flattened; ductus seminis enlarged subapically, with expansion constricted at middle.

Specimen illustrated: Norman Co., Minn.; July 17, 1923; A. A. Nichol.

***Prepops insitivus* (Say, 1832).** Fig. 50

Left clasper robust and angular; sensory lobe larger than that of *ventralis*; shaft expanded before apex, short beak at apex. Right clasper broad, cylindrical; beak at apex set at oblique angle, pointed.

Vesica similar to that of *ventralis*, but processes modified in shape and detail.

Specimen illustrated: Traer, Iowa; June 30, 1931; C. J. Drake and H. M. Harris.

Tribe Herdoniini Distant, 1904

The species of Herdoniini are distinguished by the antlike appearance; the constricted abdomen at base; and the rounded lateral margins on the pronotum like those found in the Pithanini and *Collaria*.

Approximately 19 genera are included in the tribe. Only three species from three genera were studied. The antlike form of the species is a highly specialized adaptation, but the genitalia strongly resemble those of the Mirini and the Resthenini. No significant differences in the basic pattern of the vesica were observed to support the separation of the three tribes.

Paraxenetus Reuter, 1907

Distinguished by slender form; short blunt head, with a shallow longitudinal groove between eyes; very long antennal segments, first segment reaching beyond base of pronotum; indented hemelytra at middle; long and slender legs; and short tubercles at bases of long spines on hind tibia.

One species, *P. guttulatus* (Uhl.), was studied. Externally the species resemble those of *Phytocoris*. The genitalia are relatively small for the size of species and resemble those of the Mirini.

***Paraxenetus guttulatus* (Uhler, 1887).** Fig. 51

Left clasper gently curved; sensory lobe large, rounded; shaft gradually narrows to a point. Right clasper elongate-oval; short process at apex.

Vesica membranous; apices of lobes elongate-tubular.

Specimen illustrated: Nelson Co., Va.; Aug. 10, 1924; W. Robinson.

Dacerla Signoret, 1881

Carvalho and Usinger (1957), divided this North American genus into two. The above genus contains the antlike species with a spinelike projection on pronotum, and *Paradacerla* Carv. and Using. contains the antlike species that lack this structure.

One species, *D. mediospinosa* Sign., was studied. The genitalia are very similar to those of *Paradacerla*, and indicate a very close relationship.

***Dacerla mediospinosa* Signoret, 1881.** Fig. 52

Left clasper gently curved; sensory lobe moderately developed, rounded; shaft moderately uniform in thickness, gradually narrowing to a point at apex. Right clasper suboval; short, truncate process at apex.

Vesica with the sclerotized process membranous apically, and heavily spined; ductus seminis moderately constricted subapically, gonopore broad.

Specimen illustrated: Mokelumne Hill, Calaveras Co., Calif.; Ex Lupine; May 18, 1931; R. L. Usinger.

***Paradacerla* Carvalho and Usinger, 1957**

One species, *P. formicina* (Parsh.), was studied. The genitalia show a striking resemblance to those of *Dacerla mediospinosa*, and suggest a very close relationship. Other species of the genus must be studied before the relationships can be analysed.

***Paradacerla formicina* (Parshley, 1921).** Fig. 53

Claspers very similar to those of *D. mediospinosa*; shaft of left clasper more strongly angled, and lateral serrations more pronounced. Right clasper slender; apical process not pronounced.

Vesica similar in general form to that of *mediospinosa*, but larger.

Specimen illustrated: Victoria, B.C.; June 23, 1923; K. F. Auden.

SUBFAMILY ORTHOTYLINAE VAN DUZEE, 1916

This is the third largest subfamily of the Miridae, and is composed of three tribes containing approximately 138 genera. The three tribes, Orthotylini Van D., Halticini Kirk., and Pilophorini Reut., were studied; 45 species from 30 genera were represented.

The Orthotylinae are distinguished by the following characters: large and free arolia usually spindle-shaped and convergent at apices; and the depressed pronotal collar, when present, not separated from the remainder of the pronotum by a groove.

In each tribe the genitalia of a few species differ markedly from the others. These few species are evidently more closely related to other tribes of the Orthotylinae, or to other subfamilies. Perhaps use of the arolia as a character contributed to including the heterogeneous mixture of species in each tribe, and each species must be examined before its taxonomic position can be determined.

In the Orthotylini and the Halticini, the claspers are highly irregular in form; in general, the left clasper is smaller than the right. In the Halticini the right and left clasper are remarkably similar to each other. In the Pilophorini the left clasper is larger than the right.

The vesicae of the Orthotylini and the Halticini are basically similar, the distinguishing feature being the form and appearance of the gonopore. The rim of the gonopore is characteristically oval, or horseshoe-shaped. The ductus seminis if a flexible, cylindrical tube. These features readily distinguish these tribes from the others of the family.

The vesica of the Orthotylini disclose a number of structural differences. The processes of the vesica may be present or absent. When present they are in the form of spiculi or sclerites and may vary considerably in form between species and allied groups. When the processes are absent only the ductus seminis remains. *Orthotylus* and *Lopidea* represent one extreme in which many spiculi of variable shape are present. *Ceratocapsus* represents the other extreme where only the ductus seminis is present.

Also in the Orthotylini, *Semium hirtum* Reut. illustrates an unusual case. The converging arolia place the species in the Orthotylinae, but the genitalia are very similar to those of the Phylinae, in both the claspers and the vesica. The female genitalia also suggested this relationship to the Phylinae (Slater, 1950).

The tribe Halticini appears to contain an assemblage of several unique forms. The genus *Halticus* is the only one of the tribe studied with the simple type of vesica similar to that of *Ceratocapsus*. The vesicae of the other species studied have membranous, saclike processes, enclosing several spiculi. A situation similar to that observed in the Orthotylini, in which both simple and complex vesicae were found, may also exist in this tribe.

The vesicae of *Orthocephalus*, *Euryopicoris*, and *Strongylocoris* appear very unusual in comparison with *Halticus*, and the positions of these genera in the tribe are somewhat obscure. The expanded subapical region of the ductus seminis is remarkably different from the other members of the tribe but the rim of the gonopore suggests a close relationship to the Orthotylini, as the essential features of the vesica are still present, although highly modified. When the vesica is viewed from the lateral aspect, the outline of the gonopore is similar to that of *Halticus* and the typical members of the Orthotylini. Species of *Labops* appear to fall between those of *Halticus* and the species mentioned above.

The species of the Pilophorini illustrate another problem in relationship and classification. Some genitalia differ greatly in the basic pattern and indicate relationship to the other tribes of the subfamily, and others show affinity to the other subfamilies. The genitalia of *Sericophanes* and *Pseudoxenetus* resemble those of the typical members of the Orthotylini and the Halticini. The genitalia of *Pilophorus*, *Alepidea*, and *Cyrtopeltocoris* suggest a closer relationship to the Phylinae. The external appearances of the species in the three genera are also similar to those of the Phylinae. The pronotal collar is absent, and the antlike appearance of the species resembles that of certain forms of the Phylinae. The convergent arolia are perhaps an adaptation to a specialized habitat and a further complement to the myrmecomorphic form.

Still another subfamily is represented by species of *Cyphopelta*. The genitalia of *C. modesta* Van D. are very similar to those of the Mirinae. The slender arolia, however, are parallel or slightly convergent, placing the species in the Orthotylinae.

The vesicae of the Orthotylinae appear to be highly significant in determining the relationships between species and higher categories of the subfamily. However, the evidence on hand indicates that more extensive studies of the subfamily must be undertaken before the relationships of species and the generic limits can be satisfactorily determined.

Tribe Orthotylini Van Duzee, 1916

The species of the Orthotylini are distinguished by the characters listed for the subfamily, and the following: highly irregular claspers, the left clasper generally smaller than the right; the horseshoe-shaped rim of the gonopore and the cylindrical and flexible ductus seminis; and the processes of the vesica, when present, in the form of spiculi or sclerites.

Approximately 80 genera are included in the tribe, but only 27 species from 19 genera were studied. The genitalia show group characters that are useful in determining species and in placing closely related species into natural groups.

Orthotylus Fieber, 1858

Distinguished by pallid green colour, with occasional black markings; elon-

gate, narrow form; and prominent carina at vertex of head, without stout, black bristles.

Two species, *O. notabilis* Kngt. and *ornatus* Van D., were studied. The vesica is distinctive, having a typical gonopore, flexible ductus seminis, and four slender spiculi.

***Orthotylus notabilis* Knight, 1927.** Fig. 54

Left clasper Y-shaped; sensory lobe large, densely pubescent; shaft slender, apex recurved into a hook. Right clasper flattened, subtriangular; subapical expansion rounded, with a number of small spines on median surface; apical portion curved, terminating in a short point.

Vesica with four striplike, serrate spiculi, arising from a broad sclerite; sclerite with five short digitate spines at apex; ductus seminis flexible, with distinctive horseshoe-shaped gonopore.

Specimen illustrated: Riley Co., Kan.; June 5; P. J. Parrott.

***Orthotylus ornatus* Van Duzee, 1916.** Fig. 55

Left clasper similar to that of *notabilis*, but distal half of sensory lobe more slender, with a short process at apex; shaft as in *notabilis*, but apex sharply angled. Right clasper as in *notabilis*, but subapical expansion larger, spined on outer margin.

Vesica basically similar to that of *notabilis*, with only small differences in the spiculi.

Specimen illustrated: Honeoye Falls, N.Y.; June 23, 1916; H. H. Knight.

Melanotrichus Reuter, 1875

Distinguished by small size; scalelike pubescence intermixed with nearly erect bristles on head, pronotum, and hemelytra; long bristles on carina of head; and tibia without black spots at bases of spines.

Two species, *M. atricornis* Kngt. and *althaeae* (Huss.), were studied. The genitalia are distinctive for the species. The vesica suggests a relationship to a group with two or more spiculi.

***Melanotrichus atricornis* Knight, 1927.** Fig. 56

Left clasper irregular, with several pointed processes. Right clasper gently curved, simple; apical process long and slender.

Vesica with two forked spiculi, one considerably larger and broader than the other.

Specimen illustrated: Lillooet, B.C.; May 28, 1926; J. McDunnough.

***Melanotrichus althaeae* (Hussey, 1924).** Fig. 57

Claspers slender and very similar to each other; left clasper sharply curved, short process at apex. Right clasper broadly curved; terminal process long and laterally compressed.

Vesica with three flattened spiculi, one with a short side fork near base. Phallotheca with a long pointed tip.

Specimen illustrated: Ames, Iowa; Sept. 25, 1925; H. H. Knight.

Pseudopsallus Van Duzee, 1916

Distinguished by green colour; dense, white pubescence mixed with erect hairs on body; and tibia with black spots at bases of spines.

One species, *P. artemisicola* Kngt., was studied. The genitalia are distinctive. The vesica suggests a close affinity to *Melanotrichus* and the general group with two or more spiculi on the vesica.

***Pseudopsallus artemisicola* Knight, 1930.** Fig. 58

Left clasper triangular, flattened; one angle with two short tubercles, the other with a long slender process. Right clasper quadrangular, two medial processes flattened and pointed.

Vesica with three spiculi, two with serrate margins towards apex.

Specimen illustrated: Hudson, Colo.; Aug. 25, 1925; H. H. Knight.

Reuteria Puton, 1875

Distinguished by pallid colour of hemelytra; round eyes set near middle of head, and removed from anterior margin of pronotum; and two longitudinal black lines on first antennal segment.

One species, *R. fuscicornis* Kngt., was studied. The genitalia are very distinctive. The vesica suggests an affinity to a group with two or more spiculi.

***Reuteria fuscicornis* Knight, 1939.** Fig. 59

Left clasper slender, furcate; prong between two processes short. Right clasper irregular, basal and median processes multidentate; apical process long, and sharply curved.

Vesica with three spiculi; two spiculi flattened and serrate, one with a short median fork; third spiculum very slender.

Specimen illustrated: Strawberry Point, Iowa; July 27-29, 1927; Harris and Johnston.

Heterotoma Le Peletier and Serville, 1825

Distinguished by black colour; enlarged and compressed second antennal segment; and flattened pubescence on first and second antennal segments.

One species, *H. meriopterum* (Scop.), was studied. The genitalia show characters typical of the Orthotylini. The vesica suggests a relationship to the group with three spiculi, including *Heterocordylus*, *Reuteria*, *Pseudopsallus*, and possibly *Pseudoxenetus*, at present placed in the Pilophorini.

***Heterotoma meriopterum* (Scopoli, 1763).** Fig. 60

Left clasper flattened, subtriangular; sensory lobe greatly developed, apex spined; shaft with a curved hook at apex. Right clasper very gently curved, bifurcate near apex; two large spines near middle, two near base of fork, and one short spine at apex, all on median side.

Vesica with three spiculi.

Specimen illustrated: Victoria, B.C.; July 17, 1934; W. Downes.

Heterocordylus Fieber, 1858

Distinguished by black or reddish colour; thickened subapical portion of second antennal segment; and scalelike pubescence intermixed with short, regular pubescence.

One species, *H. malinus* Reut., was studied. The genitalia are distinctive, suggesting a possible relationship to the group including *Melanotrichus*, *Pseudopsallus*, *Reuteria* and *Pseudoxenetus*.

***Heterocordylus malinus* Reuter, 1909.** Fig. 61

Claspers similar to each other, flattened and irregular, each with a number of slender processes as illustrated.

Vesica with three broadly flattened and serrate spiculi.

Specimen illustrated: Ithaca, N.Y.; June 27, 1920; H. H. Knight.

Lopidea Uhler, 1872

Distinguished by reddish-orange and black colour; and oblique suture on gena extending from antennal fossa to area beneath the eye.

Three species, *L. media* (Say), *confluens* (Say) and *teton* Kngt., were studied. The genitalia show significant specific differences, and suggest a possible relationship to the group with two spiculi on the vesica.

***Lopidea media* (Say, 1832).** Fig. 62

Left clasper rectangular; apex deeply grooved; one angle with a short tubercle. Right clasper large; process at base curved and long, almost reaching apex; median process tridentate; subapical process quadridentate; apex with a row of teeth.

Vesica with two spiculi, one subapically forked, the other serrate. Phallotheca with a shallow subapical notch.

Specimen illustrated: Eddyville, Iowa; July 15, 1927; Harris and Johnston.

***Lopidea confluens* (Say, 1832).** Fig. 63

Left clasper similar to that of *media*, but smaller and rounded. Right clasper elongate; two lateral processes short; apex expanded and serrate, one extremity rounded, the other pointed.

Vesica very similar to that of *media*, with minor specific differences.

Specimen illustrated: "Ia. Exp. Sta.; Ac. Cat. 739".

***Lopidea teton* Knight, 1923.** Fig. 64

Claspers similar to those of *confluens*, with marked specific differences.

Vesica similar to those of *media* and *confluens*, but spiculi not serrate.

Specimen illustrated: 7 mi. NW Thompson, Iowa; June 30, 1928; G. O. Hendrickson.

Ilnacora Reuter, 1876

Distinguished by green colour; black scales between light-coloured bristles on body; black, scaly spots on pronotum; and tibia without dark spots at bases of spines.

One species, *I. stalii* Reut., was studied. The genitalia are very similar to those of *Lopidea* although there are pronounced external differences between the species of the two genera.

***Ilnacora stalii* Reuter, 1876.** Fig. 65

Claspers similar to those of *Lopidea;* left clasper as in *L. confluens*, but more slender. Right clasper with two short processes at base; median process quadridentate; apical process slender, gently curved, and serrate near apex.

Vesica similar to those of *L. media* and *confluens*, but fork very short.

Specimen illustrated: Ames, Iowa; Sept. 29, 1924; H. H. Knight.

Ilnacorella Knight, 1925

Resembles *Ilnacora stalii*, but separated from it by silvery or black scales between black bristles; absence of black scales on pronotum; and first antennal segment longer than width of vertex between eyes.

One species, *I. sulcata* Kngt., was studied. The vesica suggests a relationship to *Lopidea*, *Ilnacora*, and *Slaterocoris*. The claspers also show a similar relationship, but the modifications are more pronounced.

***Ilnacorella sulcata* Knight, 1925.** Fig. 66

Sensory lobe of left clasper conical; apical process of shaft long and slender, arising at a sharp angle. Right clasper similar to that of *I. stalii;* basal and median processes slender.

Vesica with two spiculi; large spiculum grooved, other short and forked, arising from the base of large spiculum.

Specimen illustrated: Shoshone Nat. Forest, Wyo.; Aug. 7, 1927; H. H. Knight.

Slaterocoris Wagner, 1956

This genus now contains the North American species formerly placed in *Strongylocoris* Blanch. (Wagner, 1956). Wagner also suggests that the species of *Slaterocoris* have a greater affinity to species of the Orthotylini than to any other group; and this view is further supported by the present study of the genus.

Distinguished by black, shiny colour; sharp, well-defined carina on head; two disclike impressions between the eyes; and generally pubescent form of the species.

Two species, *S. stygicus* (Say) and *hirtus* (Kngt.), were studied. The genitalia indicate characteristics typical of the Orthotylini, with an affinity to *Lopidea*, *Ilnacora*, and *Ilnacorella*.

***Slaterocoris stygicus* (Say, 1832).** Fig. 67

Left clasper sharply curved, uniformly slender; shaft apically compressed. Right clasper broadly curved; median process pentadentate; distal portion with a row of four or five pointed processes.

Vesica similar to that of *I. stalii;* one spiculum flattened, sharply curved near apex; the other forked and serrate.

Specimen illustrated: Ames, Iowa; June 18, 1928; H. H. Knight.

***Slaterocoris hirtus* (Knight, 1938).** Fig. 68

Left clasper evenly curved, relatively uniform in thickness; apex of shaft with a very short process. Right clasper broadly curved; median process simple; apex trifurcate.

Vesica very similar to that of *stygicus*.

Specimen illustrated: Ames, Iowa; July 2, 1930; H. H. Knight.

Hadronema Uhler, 1871

Distinguished by generally dark colour, with traces of reddish or white; and erect, stout, black bristles on carina at vertex of head.

Two species, *H. militaris* Uhl. and *princeps* Uhl., were studied. The genitalia indicate a distinct generic group with a possible relationship to *Slaterocoris*, *Ilnacora*, *Ilnacorella*, and *Lopidea*. The membranous sac enclosing part of the ductus seminis and the spiculi appear to presage the condition that becomes fully developed in certain genera of the Halticini, particularly in *Orthocephalus*.

***Hadronema militaris* Uhler, 1872.** Fig. 69

Left clasper cylindrical, with dense silvery pubescence; apex recurved into a short beak. Right clasper flattened, gently curved; process on median side short; apex pointed.

Vesica with two spiculi; one spiculum flattened, with two very slender processes at apex; both spiculi partly enclosed by membranous sac.

***Hadronema princeps* Uhler, 1894.** Fig. 70

Left clasper curved, relatively slender; apex pointed. Right clasper similar to that of *militaris*, but median process longer, and apex rounded.

Vesica with two spiculi as in *militaris*, but modified in appearance.

Specimen illustrated: Elkwater Park, Alta.; July 18, 1952; A. R. Brooks.

Pamillia Uhler, 1887

Distinguished by antennal segments, all segments almost equal in thickness; nearly cylindrical anterior half of pronotum; sulcate emboliar margin on basal half; and silvery areas on hemelytra.

One species, *P. behrensii* Uhl., was studied. Externally the species resemble those of *Ceratocapsus* on one hand, and those of *Pilophorus* and *Sericophanes* on

the other. The vesica, however, shows characters typical of the Orthotylini, and suggests a relationship to a group with two spiculi, including *Hadronema, Slaterocoris, Ilnacorella, Ilnacora,* and *Lopidea.* The phallotheca is very distinctive, being sclerotized and paddle-shaped. It partly encloses the vesica, and protrudes conspicuously above the genital capsule.

***Pamillia behrensii* Uhler, 1887.** Fig. 71

Left clasper linear, sinuate; apical process long and slender. Right clasper very slender, with a short apical process.

Vesica with two spiculi; larger spiculum with a flattened and serrate expansion before apex. Phallotheca very flat and sclerotized, with a shallow longitudinal groove at middle.

Specimen illustrated: Pasadena, Calif.; Dec. 28, 1928.

Macrotyloides Van Duzee, 1916

Distinguished by green colour; long rostrum extending beyond hind coxa; large clypeus; and silvery, scalelike pubescence intermixed with regular pubescence.

One species, *M. vestitus* (Uhl.), was studied. The vesica is distinctive, having only one spiculum. Close relationship to *Parthenicus* and *Labopidea* is suggested.

***Macrotyloides vestitus* (Uhler, 1890).** Fig. 72

Left clasper sharply curved; sensory lobe rounded, margin minutely serrate; apex of shaft pointed. Right clasper sharply angled; apex pointed.

Vesica with a rod-shaped spiculum. Phallotheca a dome-shaped sheath.

Specimen illustrated: Moscow Mt., Idaho; June 18, 1932; T. A. Brindley.

Labopidea Uhler, 1877

This genus resembles *Macrotyloides*, except for the smaller clypeus; and a shorter rostrum, not reaching hind coxa.

One species, *L. simplex* (Uhl.), was studied. The genitalia (Fig. 73) are very similar to those of *Macrotyloides vestitus*, and suggest a congeneric condition.

Specimen illustrated: Veta Pass, Colo.; Aug. 9, 1925; H. H. Knight.

Parthenicus Reuter, 1876

Distinguished by scalelike pubescence intermixed with ordinary bristles; head without a carina on vertex; and enlarged hind femur.

One species, *P. aridus* Kngt., was studied. The genitalia suggest a relationship to *Macrotyloides* and *Labopidea.*

***Parthenicus aridus* Knight, 1918.** Fig. 74

Left clasper sharply angled; process at middle short and flattened; distal portion of shaft flattened and expanded. Right clasper similar to the left, but without expanded apical portion.

Vesica with a rod-shaped, twisted spiculum.

Specimen illustrated: Deming, N. Mex.; July 12, 1917; Trap light; H. H. Knight.

Globiceps Le Pelletier and Serville, 1825

Distinguished by myrmecomorphic and brachypterous females, with clubbed second antennal segment; macropterous males, with incrassate second antennal segment; short and perpendicular head; rounded lateral margin on pronotum; and moundlike callus.

One species, *G. dispar* (Boh.), was studied. The genitalia show characters typical of the Orthotylini, and suggest congeneric relationship to *Mecomma ambulans*, and a more distant relationship to the group including *Macrotyloides*, *Labopidea*, and *Parthenicus*. Southwood and Woodroffe (1957) place *dispar* in *Mecomma*.

***Globiceps dispar* (Boheman, 1852).** Fig. 75

Left clasper sharply curved, uniformly slender; apex pointed. Right clasper expanded, and subapically biramous.

Vesica with Y-shaped spiculum; ductus seminis slightly expanded before apex.

Specimen illustrated: Elkwater Park, Alta.; July 13, 1952; A. R. Brooks.

Mecomma Fieber, 1858

The distinguishing characteristics of *Globiceps* also apply to this genus, except that the calli of *Mecomma* are flat, and the second antennal segment in both sexes is incrassate.

One species, *M. ambulans* (Fall.), was examined. The genitalia are very similar to those of *G. dispar*, and suggest a very close relationship. Other possible relationships are mentioned under *Globiceps*.

***Mecomma ambulans* (Fallén, 1829).** Fig. 76

Claspers similar to those of *Globiceps dispar*, but more slender.

Vesica similar to that of *dispar*, but one fork of spiculum longer than the other, and sharply bent near apex.

Specimen illustrated: Bradore Bay, Que.; Aug. 2, 1930; W. J. Brown.

Ceratocapsus Reuter, 1875

Distinguished by thickened antennal segments, first three segments almost equal in thickness.

Two species, *C. modestus* (Uhl.) and *pumilus* (Uhl.), were studied. The genitalia show characters typical of the Orthotylini, and suggest a distinct generic group with a possible relationship to *Halticus* of the Halticini and *Sericophanes* of the Pilophorini. The vesica is very simple, consisting only of the flexible ductus seminis.

***Ceratocapsus modestus* (Uhler, 1887).** Fig. 77

Left clasper trifurcate; processes slender and irregular. Right clasper gently curved; short tubercles near base and apex.

Vesica consists only of ductus seminis; region of gonopore typical of Orthotylini. Phallotheca curved and conical, partly sclerotized; two dorsal flanges near base sclerotized.

Specimen illustrated: St. Anthony Pk., Minn.; Aug. 1920; H. H. Knight.

***Ceratocapsus pumilus* (Uhler, 1887).** Fig. 78

Left clasper similar to that of *modestus*. Right clasper curved, triramous; apical process delicately serrate.

Vesica and phallotheca similar to those of *modestus*, but smaller.

Specimen illustrated: Batavia, N.Y.; Aug. 1, 1916; H. H. Knight.

Semium Reuter, 1875

Distinguished by distinct suture on pronotum separating lateral area from dorsal portion; raised basal portion of pronotum projecting above scutellum; and membranous areas on head, pronotum, and scutellum.

The unusual appearance of the species in the genus has long obscured the possible relationship to their allies. The claw characteristics which place this

genus in the Orthotylinae are remarkable. The arolia are hairlike and somewhat thickened, parallel or slightly convergent at apices, simulating the condition generally found in the Orthotylinae. The claws, however, are long and slender, and resemble the type found in the Phylinae.

Two species, *S. hirtum* Reut. and *subglaber* Kngt., were examined, the former being illustrated. The genitalia are similar to the typical members of the Phylini, and suggest that *Semium* Reut. should be placed in the Phylinae. The vesica is very simple but, unlike that of *Ceratocapsus*, it is sclerotized and rigid, and the gonopore is of different pattern. The phallotheca is very similar to that of the Phylinae. The female posterior wall is also similar to those of the Phylinae (Slater, 1950).

***Semium hirtum* Reuter, 1876.** Fig. 79

Claspers typical of Phylini; left clasper gently curved; sensory lobe moderately developed, pointed at apex. Right clasper small, globular, and flattened; short process at apex.

Vesica very slender and curved, sclerotized; gonopore near apex. Phallotheca partly sclerotized; pointed at apex and curved to the left.

Specimen illustrated: Ames, Iowa; Sept. 15, 1931; H. H. Knight.

Tribe Halticini Kirkaldy, 1902

The members of this tribe are distinguished by the saltatorial femur; the high gena; and the wide vertex of head.

The tribe contains approximately 23 genera, but only nine species from five genera were studied. The vesicae, except those of *Halticus*, possess a membranous sac with several spiculi. The ductus seminis and the gonopore are similar to those of the Orthotylini.

In *Halticus*, the vesica is simple and similar to that of *Ceratocapsus* of the Orthotylini. In *Labops*, though the membranous sac is present, the ductus seminis and the gonopore resemble the type found in the Orthotylini. The ductus seminis of the other species studied is apically expanded and dorsoventrally flattened, and the rim of the gonopore is modified accordingly. The ductus seminis and the membranous sac are reliable characters for grouping allied species and genera in the tribe.

Halticus Hahn, 1832

Distinguished by small size, oval form, and black colour; large hind femur modified for jumping; shallow depression between the eyes; and very long and slender antenna, second segment four or five times as long as first.

Two species, *H. apterus* (L.) and *intermedius* Uhl., were studied. The genitalia indicate a close relationship to species of the Orthotylini. The vesica is characteristic, consisting only of the ductus seminis. It is similar to those of *Ceratocapsus* of the Orthotylini and *Sericophanes* of the Pilophorini, and suggests that the three are closely related and should be considered under one tribe, rather than three separate tribes.

***Halticus apterus* (Linnaeus, 1758).** Fig. 80

Left clasper curved; apical portion of shaft flattened and sharply recurved, the margins serrate. Right clasper flattened; broader apically than at base; apex with a large lateral tubercle.

Vesica simple; gonopore as in Orthotylini. Phallotheca dome-shaped.

Specimen illustrated: "Tschita Amur".

***Halticus intermedius* Uhler, 1904.** Fig. 81

Claspers similar to those of *apterus*, but smaller; apical portion of left clasper not noticeably flattened; apex blunt, with slender subapical process. Right clasper less flattened, and lateral tubercle at apex not as pronounced as in *apterus*.

Vesica and phallotheca very similar to those of *apterus*.

Specimen illustrated: Ft. Collins, Colo.; Dixon's Canyon; Aug. 19, 1898; E. D. Ball.

Labops Burmeister, 1835

Distinguished by distinctly pedunculate eyes.

Three species, *L. hirtus* Kngt., *hesperius* Uhl. and *sahlbergi* Fall., were studied. The genitalia suggest a distinct generic group, with a possible relationship to species of the Orthotylini on one hand, and to species of the Halticini on the other. The ductus seminis and the gonopore are similar to those of the Orthotylini, while the membranous sac and the needlelike spiculi are similar to those of *Orthocephalus*, *Euryopicoris*, and *Strongylocoris* of the Halticini.

***Labops hirtus* Knight, 1922.** Fig. 82

Left clasper elongate; sensory lobe greatly developed, apex pointed. Right clasper sharply angled and flattened, with several short spines at the bend; distal portion expanded and rounded, with short process at apex.

Vesica with a membranous sac; sac with several spiculi within; gonopore region as in Orthotylini. Phallotheca conical and curved; trifid, serrate sclerite before apex.

Specimen illustrated: Yellowstone Nat. Pk., Wyo.; Aug. 8, 1927; H. H. Knight.

***Labops hesperius* Uhler, 1871.** Fig. 83

Left clasper similar to that of *hirtus*, but gently curved. Right clasper as in *hirtus*, but not as sharply angled, with several stiff bristles at the bend; distal portion without the process.

Vesica similar to that of *hirtus*. Phallotheca smaller than that of *hirtus*; subapical sclerite differently shaped.

Specimen illustrated: Manyberries, Alta.; June 4, 1952; A. R. Brooks.

***Labops sahlbergi* Fallén, 1829.** Fig. 84

Left clasper similar to that of *hirtus*, but sensory lobe shorter. Right clasper similar to that of *hirtus*, but without the process.

Vesica as in other species of *Labops* studied. Phallotheca with two sclerites.

Specimen illustrated: "Lac Nuorti Envald".

Orthocephalus Fieber, 1858

Distinguished by black colour; white, scalelike pubescence mixed with ordinary bristles; long, stiff bristles on head and pronotum; and two pale spots at vertex of head.

Two species, *O. mutabilis* (Fall.) and *brevis* (Panz.), were studied. The genitalia suggest a distinct generic group. The apical region of the ductus seminis is greatly expanded, and the membranous sac enclosing the gonopore has two long spiculi. A close relationship to *Euryopicoris* and *Strongylocoris* is suggested.

***Orthocephalus mutabilis* (Fallén, 1807).** Fig. 85

Left clasper sharply angled; sensory lobe rounded; shaft slender, with short beak at apex. Right clasper flattened, oval; margin serrate, apex rounded.

Vesica with the terminal region of ductus seminis expanded, dorsoventrally flattened; membranous sac with two elongate spiculi. Phallotheca membranous, domelike; lateral expansions at base small.

Specimen illustrated: Ringwood, Ithaca, N.Y.; July 13, 1920; H. H. Knight.

***Orthocephalus brevis* (Panzer, 1798).** Fig. 86

This species is larger and less pubescent than *mutabilis*, with rugose rather than smooth pronotum.

Claspers similar to those of *mutabilis*, but right clasper more elongate and only slightly flattened; tubercle at apex short.

Vesica and phallotheca very similar to those of *mutabilis*.

Specimen illustrated: "Carinth, alp".

Strongylocoris Blanchard, 1840

Wagner (1956) divided this genus into two. The above genus is confined to Europe, Asia, and North Africa, and belongs to the Halticini, whereas *Slaterocoris* Wagn. is restricted to North America, and belongs to the Orthotylini.

Distinguished by small size, black colour, and oval form; short and flat head; lunate posterior margin of head when viewed from above; and width of head across eyes greater than length of second antennal segment.

One species, *S. leucocephalus* (L.), was examined. The genitalia are very closely related to those of *Euryopicoris*, and more distantly to those of *Orthocephalus* and *Labops*. The apical region of the ductus seminis is expanded, somewhat dorsoventrally flattened, and the membranous sac contains four short spiculi. The claspers are very similar to those of *Orthocephalus* and *Euryopicoris*.

***Strongylocoris leucocephalus* (Linnaeus, 1758).** Fig. 87

Claspers similar to those of *Orthocephalus brevis*, but shaft of left clasper with serrate subapical margin; right clasper more strongly angled, narrower, and with several short spines.

Vesica with apical region of ductus seminis expanded and dorsoventrally flattened; membranous sac with four short spiculi. Phallotheca with a large, serrate subapical dome.

Specimen illustrated: "Thuring, German".

Euryopicoris Reuter, 1875

Euryopicoris is very closely related to *Strongylocoris*. The distinguishing characteristics listed for the latter genus also apply to *Euryopicoris*. The two genera appear not to be distinct.

One species, *E. nitidus* (Mey.), was studied. The genitalia resemble those of *Strongylocoris* and *Orthocephalus*. The ductus seminis is expanded in the region of the gonopore, and the membranous sac contains several short spiculi.

***Euryopicoris nitidus* (Meyer, 1843).** Fig. 88

Claspers very similar to those of *Strongylocoris leucocephalus*, but shaft of left clasper with serrate subapical flange; right clasper broader near apex.

Vesica similar to that of *leucocephalus* but smaller; membranous sac with several spikelike spicules. Phallotheca dome-shaped; expansion at base similar to that of *Orthocephalus mutabilis*.

Specimen illustrated: "Europe".

Tribe Pilophorini Reuter, 1883

Myrmecomorphic species with abdomen constricted at base are placed in this tribe. However, members of the tribe differ considerably from one another in external appearance, and the genitalia show relationship to the other tribes of the family.

The tribe contains 27 genera, but only nine species from six genera were available for examination. The genitalia of *Pilophorus* are very different from those of the typical members of the Orthotylini and the Halticini; in fact, the

genitalia appear to be closer to those of the Phylinae than of the Orthotylinae. The arolia, however, are similar to those of the Orthotylinae. Thus *Pilophorus* may be a connecting link between the Phylinae and the Orthotylinae, or the genus may belong to the Phylinae; the convergent arolia being a specialized adaptation.

Two other genera, *Alepidea* and *Cyrtopeltocoris*, were found to have genitalia similar to those of *Pilophorus*, and all resemble those of the Phylinae. The other genera studied show greater similarity to genera of the Orthotylini or the Halticini, and the Mirinae.

The vesica of *Sericophanes* is of the simple type, and approaches the type found in *Ceratocapsus* and *Halticus*. The genitalia of *Pseudoxenetus*, on the other hand, are very much like those of the Orthotylini and belong to the group of species characterized by three spiculi on the vesica, as in *Melanotrichus*, *Pseudopsallus*, *Reuteria*, and *Heterocordylus*.

The genitalia of *Cyphopelta modesta* Van D., show characters typical of the Mirinae. The coil-like rim of the gonopore, and the bulbous, membranous lobes, place this species with the Mirini.

Perhaps use of the arolia as a character contributed to including the heterogeneous mixture of species in the tribe, and other species must be examined before the status of the tribe can be evaluated and the relationship of *Pilophorus* and associated genera understood with certainty.

Pilophorus Westwood, 1876

Distinguished by slender antlike form; hemelytra constricted at middle and with silvery pubescent bands; and compressed and carinate vertex of head, overlapping the anterior margin of pronotum.

Four species, *P. amoenus* Uhl., *strobicola* Kngt., *clavatus* (L.) and *uhleri* Kngt., were examined. The genitalia of *uhleri* are not illustrated. The genitalia of the four species are very similar, but are very different from those of the other Orthotylinae, and appear to show no relationship to the subfamily. The sclerotized vesica suggests a closer affinity to the Phylinae than to the Orthotylinae. The female genitalia suggest only a distant relationship to the Orthotylinae (Slater, 1950).

***Pilophorus amoenus* Uhler, 1887.** Fig. 89

Left clasper sinuate; sensory lobe and shaft similar, slender. Right clasper oval, flattened; short process at apex.

Vesica with the ductus seminis sclerotized, curved; process above gonopore semi-membranous; spiculum below gonopore slender. Phallotheca sclerotized and curved to the left as in Phylinae.

Specimen illustrated: Vienna, Virginia; July 23, 1926. H. H. Knight.

***Pilophorus strobicola* Knight, 1926.** Fig. 90

Genitalia very similar to those of *amoenus*, *uhleri*, and *clavatus* (Fig. 91).

Specimen illustrated: Ringwood, Ithaca, N.Y.; July 13, 1920; H. H. Knight.

Alepidia Reuter, 1909

Species are very similar in appearance to those of *Pilophorus*, but are smaller in size, and hemelytra lack silvery pubescent bands.

One species, *A. gracilis* (Uhl.), was studied. The genitalia suggest a congeneric relationship to *Pilophorus*.

***Alepidia gracilis* (Uhler, 1895).** Fig. 92

Genitalia very similar to those of *Pilophorus* studied.

Specimen illustrated: McGregor, Iowa; On Island; July 28, 1927; Harris and Johnston.

Cyrtopeltocoris Reuter, 1875

Distinguished by narrow form; tumid scutellum; and impunctate pronotum.

One species, *C. albofasciatus* Reut., was studied. The genitalia resemble those of the Phylinae. The claws are also like those of the Phylinae, although the arolia are hairlike and converge at apices, suggesting an affinity to those of the Orthotylinae.

***Cyrtopeltocoris albofasciatus* Reuter, 1876.** Fig. 93

Left clasper distinctive, similar to those of Phylinae. Right clasper very small, compressed; short process at apex.

Vesica very slender, elongate; sharply angled near base and apex. Phallotheca apically angled as in Phylini.

Specimen illustrated: Gillette, Tex.; June 26, 1917; H. H. Knight.

Sericophanes Reuter, 1876

Distinguished by second and third antennal segments, both of equal thickness; and hemelytra indented at middle, with several silvery, pollinose bands.

One species, *S. heidemanni* Popp., was examined. The genitalia suggest a stronger affinity to those of the Orthotylini and the Halticini than to *Pilophorus*. The vesica is very simple, and consists only of a flexible ductus seminis, thus showing a structural similarity to those of *Ceratocapsus* and *Halticus*. The gonopore is typical of the Orthotylini.

***Sericophanes heidemanni* Poppius, 1914.** Fig. 94

Left clasper gently curved, relatively slender; short beak at apex. Right clasper globular, strongly sinuate; apical process flattened.

Vesica simple; gonopore region similar to those of Orthotylini. Phallotheca a dome-shaped sheath.

Specimen illustrated: "Ames, Iowa; July 21, 1893".

Pseudoxenetus Reuter, 1909

Distinguished by elongate form; long antennal segments; immarginate vertex of head; narrow pronotum in front; and absent pronotal collar.

One species, *P. scutellatus* (Uhl.), was examined. The genitalia are very similar to those of the Orthotylini, particularly *Melanotrichus*, *Pseudopsallus*, *Reuteria* and *Heterocordylus*. The antlike form of *scutellatus* is highly specialized and is very different from those in the group; however, the genitalia strongly suggest that *scutellatus* is more closely related to species of the Orthotylini than to the Pilophorini. The female genitalia (Slater, 1950) also suggest the relationship to the Orthotylini.

***Pseudoxenetus scutellatus* (Uhler, 1890).** Fig. 95

Left clasper subtriangular, flattened; sensory lobe long and slender, apex pointed; shaft thick, apex biramous. Right clasper curved; process at base of clasper bidentate at apex; distal portion globate; two short spines at apex.

Vesica with three spiculi; one spiculum slender and serrate subapically; others broad, one with a deep subapical notch; region of gonopore as in *Heterocordylus*.

Specimen illustrated: Portage, N.Y.; June 22, 1916. H. H. Knight.

Cyphopelta Van Duzee, 1910

Distinguished by constricted pronotum in front; and strongly tumid scutellum.

One species, *C. modesta* Van D., was studied. The genitalia are remarkably similar to those of the Mirinae. The vesica with the distinctive rim of the gonopore and the bulbous lobes is very similar to those of the Mirini. The arolia are hairlike, parallel or slightly convergent, and are atypical for the Mirinae and the Orthotylinae.

Cyphopelta modesta may be closely related to *Closterocoris,* presently placed in the Phylinae, but whose genitalia indicate an affinity to those of the Mirinae.

***Cyphopelta modesta* Van Duzee, 1910.** Fig. 96

Left clasper curved; sensory lobe well developed, dome-shaped; shaft slender, short hook at apex. Right clasper subcylindrical; short oblique process at apex.

Vesica membranous; lobes bulbous, spinose, and variously shaped; ductus seminis expanded before apex; gonopore typical of Mirinae.

Specimen illustrated: Mt. Tamalpais, Marin Co., Calif., May 23, 1909; E. C. Van Dyke.

SUBFAMILY DERAEOCORINAE DOUGLAS AND SCOTT, 1865

This is a relatively small subfamily, and is composed of five small tribes containing approximately 60 genera. The following three tribes were studied: Deraeocorini D. & S., Clivinemini Reut., and Hyaliodini Carv. and Drake; 14 species from eight genera were represented. No material was available from Termatophylini Reut. and Saturniomirini Carv.

The Deraeocorinae are distinguished by the hairlike arolia as in the Phylinae, but the pseudarolia are absent. The claws are generally toothed or thickened at the bases and sharply angled. The hemelytra are deeply punctured and generally bear long pubescence; the pronotal collar is present.

The genitalia show considerable diversity in form. The left clasper is gently or sharply curved, and the sensory lobe varies considerably in size and form. The right clasper is generally elongate, with a prominent apical process. In general appearance, the claspers resemble those of the Mirinae.

The distinctive features of the vesica are the gonopore and the region surrounding it; the bulbous and spiculate processes; and the flexible ductus seminis. The vesica resembles that of the Mirinae, but the gonopore lacks the coil-like rim. The phallothecae are also similar in the two subfamilies.

Tribe Deraeocorini Douglas and Scott, 1865

The species of the Deraeocorini are characterized by the medium to large size; the generally dark colour; and the distinctive vesica.

The tribe contains approximately 26 genera, but only 10 species from five genera were studied. The genitalia show characters that are similar to those of the Mirinae, except for the pattern of the rim of the gonopore. The vesica suggests that at least three groups are represented by the species studied in the tribe.

Deraeocoris Kirschbaum, 1855

Distinguished by medium to large size; smooth frons; distinctly punctate pronotum and hemelytra; and small clypeus, not projecting beyond apex of first antennal segment.

Some Nearctic species of *Deraeocoris* cannot be correctly keyed to the genus in the key to world genera by Carvalho (1955). In view of this difficulty, the following characters of the species studied are listed: rostrum reaching middle or hind coxa; lateral margin of pronotum rounded or sharply carinate; second antennal segment with one type of pubescence or with additional long setae; vertex on head carinate or smooth; and the collar on pronotum glabrous or covered with white, fuzzy pubescence.

Six representatives, *D. sayi* Reut., *fasciolus* Kngt., *aphidiphagus* Kngt., *ruber segusinus* (Müll.), *atriventris* Kngt. and *histrio* Reut., were studied. The claspers

resemble those of the Mirinae. The vesica, although similar in many respects to those of the Mirinae, is quite different in the gonopore.

The vesicae suggest two closely related groups of species, those of *atriventris*, *histrio* and *ruber segusinus* representing one group, in which the gonopore opens into a depressed area without sclerotized plates (Figs. 97-99). The other group, including *sayi*, *fasciolus* and *aphidiphagus* has a similar depressed gonopore, and in addition the gonopore is flanked by serrate, platelike structures. The processes at the base of the vesica are also sclerotized (Figs. 100-102).

It is noteworthy that when the gonopore without the sclerotized plates is viewed from the lateral aspect it resembles those of *Orthocephalus* and other Halticini. The spicules on the vesicae of *D. histrio* and *D. atriventris* resemble the spines on the vesicae of the Halticini. The relationship to the Orthotylinae is also suggested by the female genitalia investigated by Slater (1950).

On the other hand, the bulbous lobes and the spiculi of the Deraeocorini are similar to those of the Mirinae. The spicules of *Ganocapsus filiformis* and *Horcias sexmaculatus* of the Mirini resemble those of the Halticini and the Deraeocorini. These similarities in the vesicae suggest that the Deraeocorinae are distantly related to the Orthotylinae and the Mirinae.

***Deraeocoris atriventris* Knight, 1921.** Fig. 97

Left clasper curved; sensory lobe conical; shaft compressed; short, beaklike process at apex. Right clasper small; apex truncate.

Vesica mostly membranous; two larger lobes each with a short apical process; corkscrew spiculum with short, bristlelike spicules; region of gonopore depressed.

Specimen illustrated: Mt. Lemon, Ariz.; Santa Cat. Mts.; July 27, 1917; Alt. 9,000 ft.; H. H. Knight.

***Deraeocoris histrio* Reuter, 1876.** Fig. 98

Left clasper similar to that of *atriventris*, but larger, and sensory lobe truncate; shaft pointed at apex. Right clasper subcylindrical; area before apex somewhat excavated; apical process pointed.

Vesica similar to that of *atriventris;* corkscrew spiculum larger, and bristlelike spicules longer.

Specimen illustrated: Ft. Madison, Iowa; July 12-13, 1927; Harris and Johnston.

***Deraeocoris ruber segusinus* (Müller, 1766).** Fig. 99

Left clasper gently curved; sensory lobe conical; shaft somewhat flattened and ridged; short beak before apex. Right clasper cylindrical; apex broad, biramous.

Vesica with three short spiculi and long, tubular lobe; gonopore region depressed.

Specimen illustrated: Harvard Bot. Garden; Cambridge, Mass.; July 11, 1921; Harold Morrison.

***Deraeocoris sayi* Reuter, 1876.** Fig. 100

Left clasper gently curved; sensory lobe conical; shaft flattened, narrow flange before apex; short process at apex. Right clasper oval; apex T-shaped.

Vesica with membranous lobes, and slender, flattened spiculi; lateral region of gonopore bordered by plates with serrate margins.

Specimen illustrated: Payne County; Electric light; May 19, 1924; W. J. Brown.

***Deraeocoris fasciolus* Knight, 1921.** Fig. 101

General aspect of claspers similar to those of *sayi*; sensory lobe of left clasper dome-shaped.

Vesica very similar to that of *sayi*, with slight modifications.

Specimen illustrated: Elkader, Iowa; July 28, 1927; Harris and Johnston.

***Deraeocoris aphidiphagus* Knight, 1921.** Fig. 102

Left clasper as in *sayi*, but sensory lobe very large, conical; shaft slender, apex pointed. Right clasper angled; apex truncate.

Vesica similar to those of *sayi* and *fasciolus*, but membranous lobes larger and more numerous.

Specimen illustrated: Batavia, N.Y.; July 7, 1916; H. H. Knight.

Deraeocapsus Knight, 1920

This genus has the same general aspect as that of *Deraeocoris*. Separated from *Deraeocoris* by distinctly clavate second antennal segment; claws not toothed at base; and first segment of hind tarsus longer than second.

One species, *D. fraternus* Van D., was examined. The genitalia are very similar to these of *Deraeocoris*, particularly *sayi*, *fasciolus* and *aphidiphagus*. A very close relationship is indicated; indeed, the differences in the genitalia are less pronounced between these two genera than among the species of *Deraeocoris*.

***Deraeocapsus fraternus* Van Duzee, 1916.** Fig. 103

Claspers similar to those of *D. ruber segusinus;* sensory lobe of left clasper conical; shaft flattened; short beak at apex. Right clasper relatively longer than that of *ruber segusinus*, but apical process similar.

Vesica semi-membranous; two larger lobes tubular; one spiculum paddle-shaped, the other slender; gonopore region as in *Deraeocoris fasciolus*, but plates reduced in number; area between plates studded with short barbs. Phallotheca with a short subapical flange.

Specimen illustrated: Anthony-Cutchflat Trail, 7100-7850 ft.; Blue Mts., Ore.; Aug. 8, 1929; H. A. Scullen.

Eustictus Reuter, 1909

Distinguished by striate frons; and very large eyes, with only a very narrow sulcate vertex between.

One species, *E. catulus* (Uhl.), was studied. The genitalia suggest a distinct group within the tribe. The region of the gonopore is in the form of a trough, with serrate margins. A broad plate partially surrounds the base of the vesica. The genus may be related to *Klopicoris* and *Eurychilopterella* of the Deraeocorini, and *Clivinema* and *Largidea* of the Clivinemini.

***Eustictus catulus* (Uhler, 1894).** Fig. 104

Left clasper with a large and conical sensory lobe; bristles very long and curved at apices; shaft slender, apex pointed. Right clasper slender; apical process curved.

Vesica bilobed with tubular lobes; gonopore region in the form of a trough with serrate margins; base of vesica partially covered by serrate plate.

Specimen illustrated: Gillette, Tex.; June 26, 1917; H. H. Knight.

Klopicoris Van Duzee, 1915

Distinguished by clavate second antennal segment; slightly tumid scutellum; glabrous and impunctate hemelytra, except for the claval suture; and deep cuneal fracture.

One species, *K. phorodendronae* (Van D.), was examined. The genitalia are distinctive and suggest a possible relationship to *Eustictus* and *Eurychilopterella*.

***Klopicoris phorodendronae* (Van Duzee, 1914).** Fig. 105

Left clasper small, sharply curved; shaft relatively slender, expanded and flattened subapically; apex pointed. Right clasper subcylindrical, small.

Vesica with the gonopore region excavated, the concavity studded with barbs; two platelike structures below gonopore, thin; spiculum slender, originating below gonopore.

Specimen illustrated: Chiricahua Mts. Ariz.; Alt. 6200 ft.; June 20, 1928; A. A. Nichol.

Eurychilopterella Reuter, 1909

The general aspect of this genus is similar to that of *Deraeocoris*. Separated from *Deraeocoris* by the large projecting clypeus which extends beyond the apex of first antennal segment.

One species, *E. luridula* Reut., was examined. The vesica has an elevated ridge below the gonopore which may be comparable to the platelike structures of *K. phorodendronae*. A relationship to *Klopicoris* and *Clivinema* is also suggested.

***Eurychilopterella luridula* Reuter, 1909.** Fig. 106

Left clasper very similar to that of *Klopicoris phorodendronae*, but sensory lobe large, and apical portion of shaft not as flattened. Right clasper broader distally than at base; short process at apex.

Vesica with tubular lobes; spiculum hooked at apex; gonopore region depressed, suboval; ridge below gonopore thin.

Specimen illustrated: Holly, N.Y.; July 8, 1914; H. H. Knight.

Tribe Clivinemini Reuter, 1875

The species of this tribe are distinguished by the impressed line extending from the anterolateral corner of the pronotum to the hind margin of the callus. Some species have a number of unique features, such as the hooded pronotum; the very dense, long pubescence; the short, fuzzy white pubescence; or being completely glabrous. The claws are the same as in the Deraeocorini.

Ten genera are included in the tribe, but only two species from two genera were studied. The genitalia of *Bothynotus* and *Ofellus* illustrated by Kullenberg (1947a) and Carvalho and Sailer (1953), respectively, are very similar to those of *Largidea* and *Clivinema*, and all the species appear to belong to the same general group. Though the external differences are considerable, the genitalia of these genera resemble those of *Klopicoris* and *Eurychilopterella* of the Deraeocorini.

Clivinema Reuter, 1875

Distinguished by unique pronotum, projecting over the head to form a hood; dense, somewhat flattened and hooked pubescence on pronotum and hemelytra; tumid scutellum covered with dense pubescence; and second antennal segment as thick as first.

One species, *C. villosa* Reut., was studied. The region of the gonopore is in the form of a long trough, and is similar to those observed in *Klopicoris* and *Eurychilopterella* of the Deraeocorini.

***Clivinema villosa* Reuter, 1876.** Fig. 107

Left clasper twisted, uniformly slender; apical portion of shaft slightly flattened, apex pointed. Right clasper short; two short processes at apex.

Vesica with the gonopore in a shallow trough; surrounding sclerite broad; spiculum slender and long, subapically expanded and pointed at apex.

Specimen illustrated: College Station, Tex.; Oct. 12, 1928; Light trap; S. E. Jones.

Largidea Van Duzee, 1912

Distinguished by cystiform anterior margin and carinate lateral margin on pronotum; and stout, clavate second antennal segment.

One species, *L. rubida* (Uhl.), was studied. The claspers are very similar to those of *Clivinema*. The vesica is very similar to those of *Bothynotus* (Kullenberg, 1947a) and *Ofellus* (Carvalho and Sailer, 1953). Undoubtedly the three genera are very closely related.

***Largidea rubida* (Uhler, 1904).** Fig. 108

Claspers very similar to those of *Clivinema villosa*.

Vesica with several spinulate lobes, and one slender spiculum adnate to the sac; gonopore region without a trough.

Specimen illustrated: Salida, Colo.; July 24, 1900; E. D. Ball.

Tribe Hyaliodini Carvalho and Drake, 1943

The species of the tribe are distinguished by the narrow and slender form; the hyaline, transparent and glassy hemelytra; and the greatly enlarged emboliar margin.

The tribe contains 14 genera. Only two species of *Hyaliodes* were studied. The external appearance and the female genitalia suggest that this tribe is closely related to the Diciphini (Slater, 1950). The present study suggests that the Hyaliodini are closer to the Clivinemini and the Dicyphini than to the other tribes.

Hyaliodes Reuter, 1876

Distinguished by elongate-slender form; eyes situated on anterior lateral portion of head, removed from collar by a distance approximately equal to width of eye; and one cell on the membrane.

Two species, *H. vitripennis* (Say) and *harti* Kngt., were studied. The genitalia are distinctive and show an affinity to those of the Clivinemini, some Deraeocorini, and the Dicyphini. The vesica is membranous, and the gonopore is similar to those of *Largidea* and the Dicyphini. The phallotheca is a simple, dome-shaped sheath.

***Hyaliodes vitripennis* (Say, 1832).** Fig. 109

Left clasper slender, uniform in thickness, and sharply bent near base; shaft constricted subapically; pointed process at apex. Right clasper gently curved, small.

Vesica membranous; lobes with slender processes at apices; ductus seminis flexible as in the other species of the subfamily.

Specimen illustrated: Ottumwa, Iowa; July 15, 1927; Harris and Johnston.

***Hyaliodes harti* Knight, 1941.** Fig. 110

Claspers similar to those of *vitripennis*, with minor specific differences.

Vesica quite different from that of *vitripennis*; membranous lobes larger than in *vitripennis*, with series of short spines.

Specimen illustrated: Braddyville, Iowa; July 21, 1927; Harris and Johnston.

SUBFAMILY PHYLINAE DOUGLAS AND SCOTT, 1865

This is the second largest subfamily of the Miridae, and is composed of three tribes containing approximately 190 genera. Material from Phylini D. & S., Hallodapini Van D., and Dicyphini Reut. was available for study; 28 species from 19 genera were represented.

The Phylinae are distinguished by the following characters: straight and hairlike arolia; present or absent pseudarolia, either free or connected with the claws, and arising from the bases or inner margins of the claws; and usually absent pronotal collar.

The genitalia of the Phylini are very much alike. The left clasper is very distinctive; the sensory lobe is pointed, and with the shaft forms a depression in which the phallus rests when in repose. The right clasper is small and laterally compressed and bears a short process at the apex. The distinguishing feature of the vesica is the highly sclerotized and rigid ductus seminis, variously twisted, with one or two apical processes. The gonopore is oval in outline. The phallotheca is rigid, and the terminal portion is sharply bent to the left to fit the contour of the vesica.

The genitalia of the Hallodapini are very similar to those of the Phylini, although the tribes differ markedly in external appearance. The genitalia suggest such a close relationship that the two tribes may be considered as one, the differences in the genitalia between the two tribes being no greater than those between species.

Another unusual situation in the Hallodapini is that of *Closterocoris amoenus* (Prov.). The genitalia show characters typical of the Mirinae. The arolia, however, are hairlike and parallel, a condition common in the Phylini. A similar condition was found in *Cyphopelta modesta* Van D. of the Orthotylinae, to which *Closterocoris* may be closely related. According to the genitalia, *Closterocoris amoenus* and *Cyphopelta modesta* should be in the Mirinae.

The Dicyphini differ considerably from the other two tribes, in both external appearance and the genitalia, and no close relationship is suggested. This tribe was once considered as a subfamily (Oshanin, 1912), which later contained the tribe Hallodapini and a host of genera (Van Duzee, 1917) now placed in the Phylinae, the Orthotylinae, the Deraeocorinae, and the Mirinae. The present study suggests that the relationship of the Dicyphini to the Phylini and the Hallodapini is remote. The entirely different type of genitalia, the broad collar on the pronotum, and the different claw characteristics remove the Dicyphini from the Phylinae. The tribe appears to be more closely related to the Cylapinae or the Deraeocorinae than to any other subfamily. Or the tribe may belong in a separate subfamily.

The distinctive genitalia of the tribes of this subfamily are highly significant in determining the relationships of species and in placing genera in the proper systematic order.

Tribe Phylini Douglas and Scott, 1865

The species of the tribe are distinguished mainly by the genitalia: the biramous left clasper; the very small and flattened right clasper; the sclerotized and slender vesica; and the sclerotized phallotheca, angled to the left and pointed at the apex.

The tribe contains approximately 125 genera. Only 17 species from 13 genera were studied. The genitalia show typical group characters that vary little in the tribe and are thus reliable in placing anomalous species encountered in other tribes. The genitalia of certain other species placed in various genera are so similar as to suggest congeneric relationship.

Plagiognathus Fieber, 1858

Distinguished by dark spots at bases of spines on hind tibia; minute pseudarolia; immarginate vertex on head; emarginate eye next to antennal fossa and separated from fossa by not more than one-eighth the diameter of fossa; and yellowish or dark pubescence on hemelytra.

Four representatives, *P. blatchleyi* Reut., *moerens* Reut., *longipennis* (Uhl.) and *obscurus fraternus* Uhl., were studied. The genitalia are very similar and show common tribal characters.

***Plagiognathus blatchleyi* Reuter, 1912.** Fig. 111

Left clasper biramous, characteristic for the tribe. Right clasper elongate-oval; short process at apex.

Vesica elongate; ductus seminis sclerotized and rigid, apex bispiculate; gonopore oval, located at bases of spiculi. Phallotheca sclerotized, sharply angled to the left at middle, apex pointed.

Specimen illustrated: Lancaster, N.Y.; Aug. 1886; E. P. Van Duzee.

***Plagiognathus obscurus fraternus* Uhler, 1895.** Fig. 112

Claspers similar to those of *blatchleyi*, with only small specific differences.

Vesica of the same general form as in *blatchleyi*.

Specimen illustrated: Colden, N.Y.; July, 1885; E. P. Van Duzee.

***Plagiognathus moerens* Reuter, 1909.** Fig. 113

Claspers very similar to those of *blatchleyi*, with small specific differences.

Vesica similar to that of preceding species, with slight specific differences.

Specimen illustrated: Moscow, Idaho; July 10, 1932; T. A. Brindley.

***Plagiognathus longipennis* (Uhler, 1895).** Fig. 114

Claspers similar to those of *blatchleyi*.

Vesica similar to that of *blatchleyi*, but apical processes smaller.

Specimen illustrated: Mt. Lemon, Ariz.; Santa Cat. Mts.; Alt. 9000 ft.; July 27, 1917; H. H. Knight.

Microphylellus Reuter, 1909

This genus shows a close affinity to *Plagiognathus*, and has the same distinguishing characteristics except that the spines on the hind tibia lack the black spots at their bases.

One species, *M. longirostris* Kngt., was examined. The claspers and vesica show characteristics typical of the Phylini. The genitalia and the external appearance are similar to those of *Plagiognathus*, and suggest congeneric relationship.

***Microphylellus longirostris* Knight, 1923.** Fig. 115

Claspers similar to those of *Plagiognathus*.

Vesica very similar to that of *P. moerens*.

Specimen illustrated: Strawberry Point, Iowa; July 27-29, 1926; Harris and Johnston.

Oncotylus Fieber, 1858

Distinguished by large size and pallid colour; second antennal segment thicker than hind tibia; dark spines on hind tibia with dark spots at their bases; minute pseudarolia; and margin of eye near antennal fossa straight, separated from fossa by more than one-third the diameter of fossa.

One species, *O. guttulatus* Uhl., was studied. The claspers and vesica show characteristics typical of the Phylini. The genitalia suggest a distinct generic group and a close relationship to *Plagiognathus*.

***Oncotylus guttulatus* Uhler, 1894.** Fig. 116

Claspers very similar to those of *Microphylellus longirostris*.

Vesica similar to that of *longirostris*, but gonopore opening more apical, and one process broad and rounded at apex.

Specimen illustrated: Seligman, Ariz.; Sept. 5, 1931; H. H. Knight.

Psallus Fieber, 1858

Distinguished by silvery, scalelike hairs intermixed with common pubescence; and prominent clypeus.

One species, *P. ancorifer* (Fieb.), was studied. The genitalia show characteristics typical of the Phylini, and suggest a possible relationship to *Oncotylus*.

***Psallus ancorifer* (Fieber, 1858).** Fig. 117

Claspers similar to those of *O. guttulatus*, but small differences present. Right clasper oval; short process at apex.

Vesica similar to that of *guttulatus*, with small differences in the apical processes.

Specimen illustrated: Washington, D.C.; June 30, 1926; H. H. Knight.

Atractotomus Fieber, 1858

Distinguished by scalelike hairs intermixed with common pubescence; immarginate vertex on head; and very thick second antennal segment.

One species, *A. hesperius* (Uhl.), was studied. The genitalia suggest a distinct generic group.

***Atractotomus hesperius* (Uhler), 1872.** Fig. 118

Claspers typical for the tribe, but sensory lobe of left clasper with two conical processes.

Vesica as in *Plagiognathus*, but apical processes flattened; one process with a short subapical fork.

Specimen illustrated: Green River Lake, Wind. Riv. Mts., Wyo.; Aug. 1-8, 1935; Elev. 8,500 ft.; H. Ruckes.

Macrotylus Fieber, 1858

Species of this genus vary considerably more in external appearance than those of *Plagiognathus*, or even those of *Plagiognathus* and *Microphylellus*.

Distinguished by toothed claws; large and free pseudarolia, reaching beyond apices of claws; and protruding clypeus.

Two species, *M. tristis* Uhl. and *polemonii* Kngt., were studied. The genitalia show characteristics typical of the Phylini, and although the species show pronounced external differences the genitalia are very similar.

***Macrotylus tristis* Uhler, 1890.** Fig. 119

Claspers typical of the tribe.

Vesica with one terminal process; process with minute bristles.

Specimen illustrated: "California, Coquillett".

***Macrotylus polemonii* Knight, 1932.** Fig. 120

Claspers similar to those of *tristis*, with minor specific differences.

Vesica similar to that of *tristis*, but gonopore opening further removed from apex. Phallotheca with a broad subapical flange.

Specimen illustrated: Mt. Rainier, Wash.; Aug. 14, 1931; H. H. Knight.

Lepidopsallus Knight, 1923

Distinguished by second antennal segment, shorter than width of head across eyes; and flattened, silvery, scalelike hairs on body, intermixed with common pubescence.

One species, *L. rubidus* (Uhl.), was studied. The genitalia show characteristics typical of the tribe. Possible relationship is suggested to *Macrotylus*, *Monosynamma*, and *Conosthethus*. *Semium hirtum* Reut., of the Orthotylini, as well as *Cyrtopeltocoris* of the Pilophorini, probably belong with this group.

***Lepidopsallus rubidus* (Uhler, 1895).** Fig. 121

Claspers similar to those of preceding species.

Vesica with a short apical process, and a serrate ridge below the gonopore.

Specimen illustrated: Ithaca, N.Y.; July 26, 1916; H. H. Knight.

Monosynamma Scott, 1864

Formerly this genus was known as a junior synonym of *Microsynamma* Fieber, 1864. Carvalho (1952) revived the genus on the basis of priority.

Distinguished by yellowish pubescence; margin of eye near antennal fossa almost straight and well separated from fossa; and minute pseudarolia.

One species, *M. bohemani* (Fall.), was studied. The vesica suggests a relationship to *Campylomma* (Fig. 123), *Criocoris* (Fig. 124), and *Chlamydatus* (Fig. 125), in addition to the species mentioned under *Lepidopsallus*.

***Monosynamma bohemani* (Fallen, 1829).** Fig. 122

Claspers similar to those of preceding species.

Vesica with a single apical process.

Specimen illustrated: Lancaster, N.Y.; July 12, 1889; E. P. Van Duzee.

Reuteroscopus Kirkaldy, 1905

Distinguished by colour pattern on hemelytra; dark spines on hind tibia, without dark spots at their bases; and silvery scalelike pubescence intermixed with common hairs.

One species, *R. ornatus* (Reut.), was examined. The genitalia indicate a distinct generic group. The claspers are somewhat different from those of the other members of the tribe, and the terminal region of the vesica is considerably modified. The basal portion of the vesica, however, is very similar to that of the other species studied within the tribe.

***Reuteroscopus ornatus* (Reuter, 1876).** Fig. 126

Left clasper biramous, but apices of sensory lobe and shaft not so pointed as in typical members of the tribe. Right clasper relatively large for size of species, broadly concave on one side; apical process absent.

Basal half of vesica typical for the tribe; apical half with series of plates each bearing long and short hairlike bristles; three spiculi, and a forked process, slender. Phallotheca with a short lateral beak.

Specimen illustrated: Hollister, Mo.; July 22, 1915; H. H. Knight.

Tribe Hallodapini Van Duzee, 1916

The species of the Hallodapini are characterized by the antlike form, the abdomen being constricted at the base; the triangular pronotum; and the yellow or pale areas on the hemelytra.

The tribe contains approximately 42 genera, but only four species from three genera were studied. The genitalia of three of the species are very similar to those of the Phylini. The genitalia of the fourth species, *Closterocoris amoenus* (Prov.), suggest a closer relationship to the Mirinae.

Though external differences between the Phylini and the Hallodapini are pronounced, the genitalia are very similar. The claspers and the phallotheca are very similar in shape and detail and the differences in the vesicae appear to be no more pronounced than between genera of the Hallodapini.

Coquillettia Uhler, 1876

Distinguished by large size and elongate form; linear second antennal segment; and free pseudarolia, attached only at their bases.

Two species, *C. insignis* Uhl. and *mimetica* Osb., were studied. The genitalia suggest a close relationship to those of the Phylini.

***Coquillettia insignis* Uhler, 1890.** Fig. 127

Claspers similar in design to those of Phylini.

Vesica elongate; ductus seminis sclerotized and rigid; gonopore near apex; apical process short and curved.

Specimen illustrated: Mancos, Colo.; Aug. 13, 1925; H. H. Knight.

***Coquillettia mimetica* Osborn, 1898.** Fig. 128

Claspers very similar to those of *insignis*.

Vesica as in *insignis*, with small specific differences.

Specimen illustrated: 4 m. NE Beloit, Iowa; July 25, 1928; G. O. Hendrickson.

Orectoderus Uhler, 1876

Distinguished by large size and elongate form; incrassate second antennal segment; and pseudarolia completely united with the claws.

One species, *O. obliquus* Uhl., was studied. The genitalia are similar to those of the Phylini.

***Orectoderus obliquus* Uhler, 1876.** Fig. 129

Claspers very similar to those of Phylini.

Vesica distinctive: region surrounding gonopore expanded, and narrowed beyond into a slender apical process; gonopore depressed and bordered on one side by a spiculate plate. Phallotheca angled to the left, and dorsoventrally compressed.

Specimen illustrated: "Ft. Collins, Colo.; June 17, 1899".

Closterocoris Uhler, 1890

Distinguished by narrow and elongate form; triangular pronotum; flattened collar; and location of eyes, considerably removed from pronotal collar.

One species, *C. amoenus* (Prov.), was examined. The systematic position of the genus is untenable as the genitalia show an extremely close affinity to those of the Mirinae. The pronotal collar and the long first segment of the hind tarsus also suggest a relationship to the Mirinae. However, the arolia are straight and hairlike, and approach the type found in the Phylinae.

A similar condition was found in *Cyphopelta*, now in the Orthotylinae. The two genera should be placed in the Mirinae.

***Closterocoris amoenus* (Provancher, 1887).** Fig. 130

Left clasper gently curved; shaft relatively slender, apex rounded. Right clasper cylindrical, stout oblique tubercle at apex.

Vesica typical of Mirinae; lobes membranous, variously folded; two sclerotized processes flattened; rim of gonopore coil-like.

Specimen illustrated: Carmel, Colo.; June 20, 1918; C. L. Hubbs.

Tribe Dicyphini Reuter, 1883

The Dicyphini are characterized by the slender form; the large pronotal collar; the second segment of the hind tarsus longer than the first; the tarsal claws sharply angled at the bases; the large and free pseudarolia arising from the bases of the claws; and the hairlike arolia.

The tribe contains approximately 23 genera. Seven species from three genera were studied. The genitalia are distinctive for the tribe. The left clasper is normal in size, but the right clasper in some species is so greatly reduced that it may often be missed during dissection. The vesica consists of a

flexible ductus seminis, apically enclosed by a large membranous sac, often with slender spiculi. The gonopore opens into the sac, but its rim has no definite outline.

The present systematic position of this tribe appears to be untenable, as the genitalia and the external appearances of the species suggest no relationship to those of the Phylini or the Hallodapini. The genitalia, however, resemble those of the Cylapinae and the Deraeocorinae. The female genitalia indicate closer relationship to *Hyaliodes* (Slater, 1950). This tribe may be better considered as a subfamily.

Dicyphus Fieber, 1858

Distinguished by slender, elongate form; shiny, impunctate pronotum and hemelytra; large eyes situated near middle of head; concave base of pronotum and deep depression behind each callus; and broad pronotal collar.

Four species, *D. pallidus* (H.-S.), *gracilentus* Parsh., *famelicus* (Uhl.) and *usingeri* Kngt., were studied. The genitalia indicate distinct group characteristics that are extremely different from those of the Phylini or the Hallodapini. The vesica is membranous, characterized by a large sac enclosing the distal portion of the ductus seminis.

***Dicyphus pallidus* (Herrich-Schaeffer, 1835).** Fig. 131

Both sexes are brachypterous, the abdomen being only partially covered.

Left clasper relatively straight; sensory lobe prominent, somewhat rounded and compressed, with several long bristles; shaft curved before apex; apex pointed. Right clasper relatively short and slender.

Vesica with two slender spiculi; ductus seminis flexible. Phallotheca sclerotized and conical, with a narrow lateral flange.

Specimen illustrated: "Admont, Steierm. Strobl."

***Dicyphus gracilentus* Parshley, 1923.** Fig. 132

Left clasper gently curved, uniformly slender; shaft moderately flattened before apex. Right clasper very small.

Vesica without spiculi; ductus seminis short and wide. Phallotheca with a deep subapical notch.

Specimen illustrated: Urbana, Ill.; July 14, 1922; Perry A. Glick.

***Dicyphus famelicus* (Uhler, 1878).** Fig. 133

Claspers similar to those of *gracilentus*, but left clasper broader at base, and subapical expansion smaller.

Vesica similar to that of *gracilentus*, but smaller. Phallotheca conical as in *pallidus*, but lateral flange reduced.

Specimen illustrated: Ft. Atkinson, Iowa; Aug. 26, 1927; H. G. Johnston.

***Dicyphus usingeri* Knight, 1943.** Fig. 134

Left clasper sharply curved; sensory lobe very small, with a number of stiff hairs; shaft flattened for entire length; apex pointed. Right clasper small.

Vesica with an elongate spiculum adnate to the membranous sac; ductus seminis very long and slender.

Specimen illustrated: Oakland Rec. Camp, Tuolumne Co., Calif.; July 20, 1928; R. L. Usinger.

Cyrtopeltis Fieber, 1860

This genus has the same distinguishing characteristics as those of *Dicyphus*, except that the pronotal collar of *Cyrtopeltis* is narrower, and the eyes are very close to the pronotum.

Two species, *C. varians* (Dist.) and *geniculata* Fieb., were examined. The claspers and the vesica are similar to those of *Dicyphus*, and show characters that differ markedly from those of Phylini and Hallodapini.

***Cyrtopeltis varians* (Distant, 1883).** Fig. 135

Claspers similar to those of *Dicyphus usingeri*, but left clasper more sharply angled and apex of shaft more rounded.

Vesica similar to that of *usingeri*, but without the spiculum.

Specimen illustrated: Laredo, Tex.; Nov. 2, 1942; Wm. Buren.

***Cyrtopeltis geniculata* Fieber, 1861.** Fig. 136

Claspers similar to those of *D. usingeri*, but larger.

Vesica with the membranous sac trilobed at apex, lobes weakly spinulate; ductus seminis slender.

Specimen illustrated: "Europe".

Macrolophus Fieber, 1858

The distinguishing characters for *Dicyphus* also apply to this genus, except that the eyes in *Macrolophus* are smaller, and are removed from the pronotum by their length.

One species, *M. brevicornis* Kngt., was studied. The genitalia suggest a close relationship to *Dicyphus* and *Cyrtopeltis*. The vesica resembles that of *D. pallidus*, except for the bristles. The phallotheca is also modified, having a sclerotized recurved plate at the apex.

***Macrolophus brevicornis* Knight, 1926.** Fig. 137

Left clasper curved; shaft with three subapical notches. Right clasper small and slender.

Vesica similar to that of *Dicyphus pallidus*, except for a number of stiff, hairlike bristles. Phallotheca with a serrate plate.

Specimen illustrated: Ames, Iowa; July 1, 1894; E. D. Ball.

SUBFAMILY CYLAPINAE KIRKALDY, 1903

This is a relatively small subfamily, and is composed of three small tribes and approximately 43 genera. Material from Cylapini Kirk. and Fulviini Uhl. was available for study; four species from three genera were represented. No material was available from Bothriomirini Kirk.

The Cylapinae are distinguished by the straight, hairlike arolia, and the absent pseudarolia as in the Deraeocorinae. The claws, however, are not toothed or thickened at the bases, but are long and slender and may be toothed near the apices. The hind tibia is weakly spinose, usually long and tapering towards the apex. The pronotal collar may be obscured by the callus.

The genitalia of the Cylapini and Fulviini are unusual in that they show characters which resemble those of the Halticini and the Dicyphini. The genitalia of *Cylapus tenuicornis* are strikingly similar to those of *Orthocephalus mutabilis*, and those of *Fulvius brunneus* and *Peritropis saldiformis* to those of *Dicyphus pallidus* and *Macrolophus brevicornis*.

Tribe Cylapini Kirkaldy, 1903

The Cylapini are distinguished by the short, rounded, and deep head; the vertical frons and clypeus; the finely punctate pronotum and hemelytra; and the glabrous membrane.

Approximately 15 genera are included in the tribe. One species from one genus was studied.

Cylapus Say, 1832

Distinguished by protruding eyes, extending a considerable distance above the head; deep longitudinal impression between eyes; rounded side on pronotum; first antennal segment greatly thickened; other segments very long and slender, much longer than body; and first segment of hind tarsus as long as others united.

One species, *C. tenuicornis* Say, was studied. The vesica shows characters that are similar to those of *Orthocephalus*. However, the sclerotized processes are significantly different and do not resemble those of *Orthocephalus*.

***Cylapus tenuicornis* Say, 1832.** Fig. 138

Left clasper gently curved; sensory lobe inconspicuous; shaft pointed at apex. Right clasper slender, sinuate; apex pointed.

Vesica similar to that of *Orthocephalus mutabilis*; terminal region of ductus seminis expanded, dorsoventrally flattened; sclerotized processes of different shapes, all enclosed by a membranous sac.

Specimen illustrated: Highlands, N.C.; Aug. 22, 1957; W. R. Richards.

Tribe Fulviini Uhler, 1886

The species of this tribe are distinguished by the long, pointed head; the horizontal frons; the concave base on the pronotum; and the almost impunctate pronotum and the hemelytra.

At present the tribe contains 23 genera, but only three species from two genera were studied. The genitalia indicate a close relationship to those of the Dicyphini. The external appearances of the species in the two tribes are also similar and suggest that the Fulviini are closely related to the Dicyphini. The absence of pseudarolia is probably a specialized adaptation as the claw characters were found to vary in the other groups studied. Perhaps the genera of Fulviini studied should be included with those of Dicyphini.

Fulvius Stål, 1862

Distinguished by long first antennal segment, reaching beyond apex of head; antennal fossa contiguous with the eye; and long rostrum, extending beyond hind coxa.

Two species, *F. brunneus* (Prov.) and *imbecilis* (Say), were studied. The genitalia show pronounced specific differences and suggest a relationship to *Peritropis* and those of the Dicyphini.

***Fulvius brunneus* (Provancher, 1872).** Fig. 139

Left clasper relatively straight, sinuate on one side; sensory lobe small; apex of shaft compressed, truncate. Right clasper small, spindle-shaped.

Vesica very similar to those of Dicyphini; ductus seminis flexible, distal portion enclosed by a membranous sac; three spiculi slender.

Specimen illustrated: Mount Desert Island, Maine; Aug. 24, 1939; Wm. Procter.

***Fulvius imbecilis* (Say, 1832).** Fig. 140

Left clasper similar to that of *brunneus*, but sensory lobe large and bulbous, with long bristles. Right clasper very small and slender.

Vesica similar to that of *brunneus*, but larger and without spiculi. Phallotheca with anterior surface sclerotized and pointed at apex; remainder membranous; apex of vesica attached to apex of phallotheca.

Specimen illustrated: Trenton, Ont.; Aug. 10, 1911; Evans.

Peritropis Uhler, 1891

Distinguished by two-segmented tarsus; shagreened body; and obscured or absent pronotal collar.

One species, *P. saldiformis* Uhl., was examined. The genitalia show group characters that are similar to those of *Fulvius*. An affinity is also suggested to those of the Dicyphini.

***Peritropis saldiformis* Uhler, 1891.** Fig. 141

Left clasper curved, uniformly slender; apex of shaft notched. Right clasper flattened, sinuate; short tubercle before apex.

Vesica similar to that of *Fulvius brunneus*, but smaller and with only two spiculi.

Specimen illustrated: Idabel, Okla.; June 30, 1937; Standish and Kaiser.

SUBFAMILY BRYOCORINAE BAERENSPRUNG, 1860

The subfamily Bryocorinae is of moderate size, and is composed of three tribes and approximately 100 genera. Material from Bryocorini Baeren. was studied; five species from five genera were represented. No specimens were available from Odoniellini Reut. and Monaloniini Reut.

The Bryocorinae are distinguished by the hairlike arolia; the large pseudarolia connected to the ventral surfaces of the claws; and the thickened third tarsal segment. The membrane of the hemelytron has only one enclosed cell.

Tribe Bryocorini Baerensprung, 1860

The Bryocorini are distinguished by the small to medium size; the punctate pronotum, not constricted in front; and the flattened scutellum.

The tribe contains approximately 70 genera. Five species representing five genera were studied. The genitalia of *Hesperolabops picta* suggest a close relationship to *Halticotoma valida*, although externally the species are very different. These species do not seem to have an immediate relationship to those of *Pycnoderes*, *Sixeonotus*, and *Monalocoris*, although the three latter genera appear to be closely related. The genitalia, therefore, appear to show two distinct groups within the tribe.

In the first group, the right clasper is greatly developed and the vesica is very distinctive. The ductus seminis is very long, flexible at the base, but sclerotized and rigid beyond the middle. There is some membranous material adjacent to the sclerotization.

In the second group, the right clasper is not so greatly developed. The ductus seminis is very short and flexible, or it may be completely sclerotized as in *Monalocoris*. The phallothecae are alike in both groups, being a simple, membranous sheath.

Hesperolabops Kirkaldy, 1902

Distinguished by stylate eyes projecting dorsally; and long rostrum extending beyond posterior coxa.

One species, *H. picta* (Hunt., Pratt, and Mitch.), was studied. The genitalia are distinctive, and closely resemble those of *Halticotoma valida*, although the two species are very different externally.

***Hesperolabops picta* (Hunter, Pratt, and Mitchell, 1912).** Fig. 142

Left clasper curved; rather uniform in thickness; process at apex slender and curved. Right clasper large, broadly curved, somewhat flattened and expanded at middle; apex pointed.

Vesica distinctive: basal portion of ductus seminis flexible, distal portion sclerotized and rigid, with some adnate membranous material; gonopore terminal.

Specimen illustrated: Neucest, Tex.; Apr. 25, 1896; Marlatt.

Halticotoma Reuter, 1913

Distinguished by small size and oval shape; orange pronotum; and bluish-black colour of hemelytra.

One species, *H. valida* Reut., was examined. The genitalia indicate a relationship to *Hesperolabops*.

***Halticotoma valida* Reuter, 1913.** Fig. 143

Left clasper curved, broad at middle; apical process slender and twisted. Right clasper large; broadly curved; expanded near base; apical process sharply curved, pointed.

Vesica similar to that of *Hesperolabops*, but adjacent membranous process reduced; gonopore subapical.

Specimen illustrated: Castana, Iowa; Sept. 16, 1927; H. G. Johnston.

Pycnoderes Guerin, 1857

Distinguished by greatly inflated pronotum; broadly expanded and flattened embolium; very short pubescence, and shiny areas on hemelytra; and obscured pronotal collar.

One species, *P. medius* Kngt., was examined. The genitalia are distinctive. The vesica consists of a flexible ductus seminis, and displays considerable affinity to those of *Sixeonotus* and *Monalocoris*.

***Pycnoderes medius* Knight, 1926.** Fig. 144

Left clasper sharply curved; sensory lobe relatively large, triangular; shaft slender, hooked at apex. Right clasper uniform in thickness; sharply angled near base, the angle with a short knob; tubercle at middle cone-shaped; slender process at apex.

Vesica consists of a short and flexible ductus seminis.

Specimen illustrated: Hollister, Mo.; July 22, 1915; H. H. Knight.

Sixeonotus Reuter, 1875

Distinguished by obscured pronotal collar; moderately inflated pronotum; narrow and thick embolium; long, semi-erect pubescence; and lack of shiny areas on hemelytra.

One species, *S. nicholi* Kngt., was studied. The genitalia show a close affinity to those of *Pycnoderes*, and indicate a close relationship.

***Sixeonotus nicholi* Knight, 1928.** Fig. 145

Genitalia very similar to those of *Pycnoderes medius*.

Specimen illustrated: Chiricahua Mts., Ariz.; Alt. 6200 ft.; June 20, 1928; A. A. Nichol.

Monalocoris Dahlbom, 1851

Distinguished by small size, oval form and dark colour; pale pronotal collar; and dilated hemelytra at middle.

One species, *M. americanus* Wagn. and Slater, was examined. The genitalia are modified but appear to show an affinity to those of *Sixeonotus* and *Pycnoderes*.

***Monalocoris americanus* Wagner and Slater, 1952.** Fig. 146

Left clasper curved, relatively slender; sensory lobe very prominent; apex rounded, with short bristles on median side. Right clasper narrow, gently curved; pointed at apex.

Vesica similar to that of *Sixeonotus nicholi*, but ductus seminis sclerotized for entire length; gonopore region formed into a shallow trough. Phallotheca partly sclerotized at base.

Specimen illustrated: Knowlton, Que.; July 16, 1929; L. J. Milne.

SUMMARY

Study of the vesicae and the claspers in approximately 300 species representing 17 tribes of six subfamilies of Miridae showed that the male genitalia are of considerable taxonomic and phylogenetic value. The regions of the vesica that are of particular value are the rim of the gonopore, the ductus seminis, and the processes of the vesica. These structures often indicate relationships between species even though the external appearances show no such relationship. The study showed that the arolia and the claws are not so stable as the genitalia, and must be used with considerable caution when separating some species and genera of the family. The present taxonomic placement of a number of genera and species, based on external characters, is not in accord with the evidence offered by the genital structures.

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ILLUSTRATIONS

Male genital structures of Miridae: a, left clasper; b, right clasper; c, vesica; d, region of gonopore, lateral view; e, phallotheca.

Figs. 1-7. Mirinae. 1-3, *Leptopterna* sp. 1, apex of abdomen, dorsal view. 2, phallus, right lateral view. 3, claspers and vesica. 4, *Megaloceraea* sp. 5, 6, *Litomiris* spp. 7, *Stenodema* sp.

a, dorsolateral view (3-6); posterolateral view (7). b, lateral view. c, ventral (opposite gonopore) view (3-5); dorsal view (6, 7).

Figs. 8-19. Mirinae. 8, 9, *Stenodema* spp. 10, 11, *Trigonotylus* spp. 12, *Dolichomiris* sp. 13, 14, *Teratocoris* spp. 15, *Collaria* sp. 16, *Pithanus* sp. 17, *Mimoceps* sp. 18, 19, *Tropidosteptes* spp.

a, posterolateral view. b, lateral view. c, dorsal view (8-10); ventral view (11-19). e, right lateral view.

Figs. 20-29. Mirinae. 20, 21, *Xenoborus* spp. 22, *Neoborella* sp. 23, *Neurocolpus* sp. 24, 25, *Taedia* spp. 26, *Lampethusa* sp. 27, 28, *Irbisia* spp. 29, *Adelphocoris* sp.

a, posterolateral view. b, lateral view. c, ventral view.

Figs. 30-39. Mirinae. 30, *Stittocapsus* sp. 31, *Calocoris* sp. 32, *Polymerus* sp. 33, *Allorhinocoris* sp. 34, 35, *Stenotus* spp. 36, *Dichrooscytus* sp. 37, 38, *Phytocoris* spp. 39, *Platylygus* sp.

a, posterolateral view (30-34); dorsal view (35, 36); lateral view (37-39). b, lateral view. c, ventral view (30, 31, 33, 35, 37); right lateral view (32); dorsal view (34, 36, 38, 39).

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a, dorsolateral view (40, 41); lateral view (42, 43). b, lateral view. c, ventral view (40, 41, 43); dorsal view (42).

Figs. 44-53. Mirinae. 44, *Ganocapsus* sp. 45, *Poecilocapsus* sp. 46, *Lygidea* sp. 47, *Garganus* sp. 48, *Creontiades* sp. 49, 50, *Prepops* spp. 51, *Paraxenetus* sp. 52, *Dacerla* sp. 53, *Paradacerla* sp.

a, posterolateral view (44, 45, 51); dorsolateral view (46-50, 52, 53). b, lateral view. c, ventral view (44-46, 49, 50); dorsal view (47, 48, 51-53).

Figs. 54-62. Orthotylinae. 54, 55, *Orthotylus* spp. 56, 57, *Melanotrichus* spp. 58, *Pseudopsallus* sp. 59, *Reuteria* sp. 60, *Heterotoma* sp. 61, *Heterocordylus* sp. 62, *Lopidea* sp.

a, lateral view (54, 55, 59); posterolateral view (56, 57); ventral view (58, 60-62). b, lateral view (54-57, 59, 61); mesial view (58); dorsal view (60); posterior view (62). c, dorsal (opposite gonopore) view (54-60, 62); ventral view (61). e, right lateral view.

Figs. 63-76. Orthotylinae. 63, 64, *Lopidea* spp. 65, *Ilnacora* sp. 66, *Ilnacorella* sp. 67, 68, *Slaterocoris* spp.. 69, 70, *Hadronema* spp. 71, *Pamillia* sp. 72, *Macrotyloides* sp.. 73, *Labopidea* sp. 74, *Parthenicus* sp. 75, *Globiceps* sp. 76, *Mecomma* sp.

a, ventral view (63, 64, 69); dorsal view (65, 70, 75, 76); posterolateral view (66-68, 72-74).

b, lateral view (63, 64, 66-70, 74); mesial view (65); posterior view (72); anterior view (73); ventral view (75, 76). c, dorsal view (63-66, 69-76); ventral view (67, 68).

Figs. 77-89. Orthotylinae. 77, 78, *Ceratocapsus* spp. 79, *Semium* sp. 80, 81, *Halticus* spp. 82-84, *Labops* spp. 85, 86, *Orthocephalus* spp. 87, *Strongylocoris* sp. 88, *Euryopicoris* sp. 89, *Pilophorus* sp.

a, lateral view (77-79); ventral view (80-89). b, lateral view. c, dorsal view (77, 78, 80, 82, 85, 87); right lateral view (79, 89); left lateral view (88). d, left lateral view (80, 85, 87); right lateral view (81, 82); dorsal view (88). e, dorsal view (77, 79, 85, 88, 89); right lateral view (82-84); left lateral view (87).

Figs. 90-96. Orthotylinae. 90, 91, *Pilophorus* spp. 92, *Alepidea* sp. 93, *Cyrtopeltocoris* sp. 94, *Sericophanes* sp. 95, *Pseudoxenetus* sp. 96, *Cyphopelta* sp.

Figs. 97-100. Deraeocorinae. 97-100, *Deraeocoris* spp.

a, ventral view (90-92, 94); lateral view (93); dorsal view (95, 96); posterolateral view (97, 98, 100); posterior view (99). b, lateral view. c, right lateral view (90-93); dorsal view (94); ventral view (95-97, 99, 100); left lateral view (98).

Figs. 101-110. Deraeocorinae. 101, 102, *Deraeocoris* spp. 103, *Deraeocapsus* sp. 104, *Eustictus* sp. 105, *Klopicoris* sp. 106, *Eurychilopterella* sp. 107, *Clivinema* sp. 108, *Largidea* sp. 109, 110, *Hyaliodes* spp.

a, posterolateral view (101, 103); lateral view (102, 105-110); ventral view (104). b, lateral view. c, ventral view (101-108); dorsal view (109-110).

Figs. 111-129. Phylinae. 111-114, *Plagiognathus* spp. 115, *Microphylellus* sp. 116, *Oncotylus* sp. 117, *Psallus* sp. 118, *Atractotomus* sp. 119, 120, *Macrotylus* spp. 121, *Lepidopsallus* sp. 112, *Monosynamma* sp. 123, *Campylomma* sp. 124, *Criocoris* sp. 125, *Chlamydatus* sp. 126, *Reuteroscopus* sp. 127, 128, *Coquillettia* spp. 129, *Orectoderus* sp.

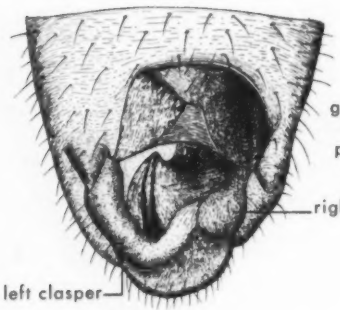
a, lateral view (111-125, 127-129); posterolateral view (126). b, lateral view. c, right lateral view (111-128); left lateral view (129).

Figs. 130-137. Phylinae. 130, *Closterocoris* sp. 131-134, *Dicyphus* spp. 135, 136, *Cyrtopeltis* spp. 137, *Macrolophus* sp.

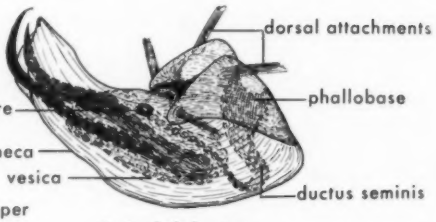
Figs. 138-141. Cylapinae. 138, *Cylapus* sp. 139, 140, *Fulvius* spp. 141, *Peritropis* sp.

Figs. 142-146. Bryocorinae. 142, *Hesperolabops* sp. 143, *Halticotoma* sp. 144, *Pycnoderes* sp. 145, *Sixeonotus* sp. 146, *Monalocoris* sp.

a, dorsal view (130, 137, 138); posterolateral view (131-136, 141, 146); anterior view (139); posterior view 140; lateral view (142, 144, 145); ventral view (143). b, mesial view (130, 137, 145); lateral view (131-136, 138, 141-144, 146); dorsal view (139, 140). c, dorsal view (130-134, 136, 138-140, 142, 144-146); right lateral view (135, 143); left lateral view (137); ventral view (141). e, dorsal view.



1. *L. dolabratus*



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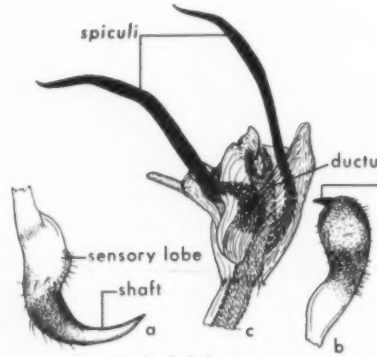

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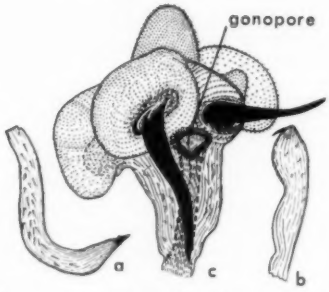

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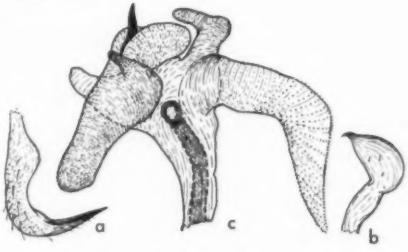

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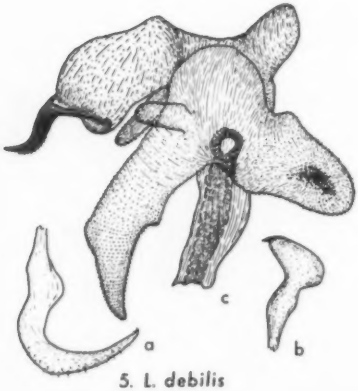

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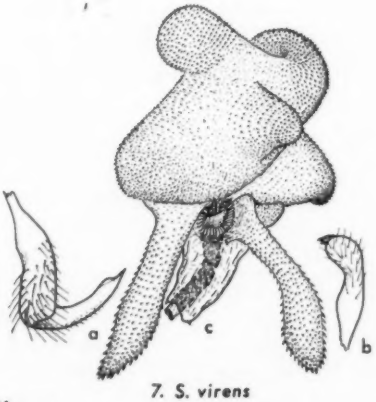
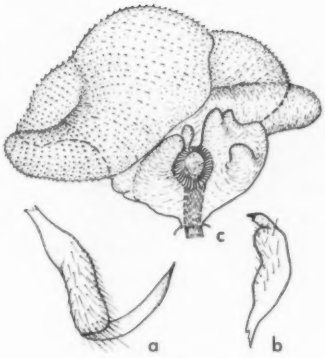


7. *S. virens*

0.5 MM.



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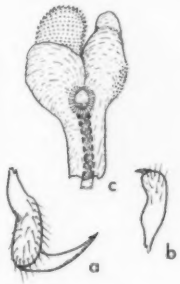
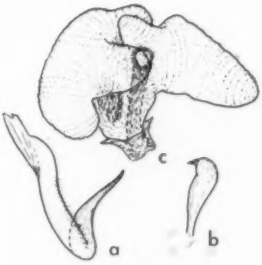


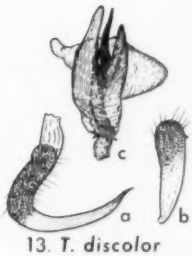
9. *S. trispinosum*

10. *T. ruficornis*



11. *T. tarsalis*

12. *D. linearis*



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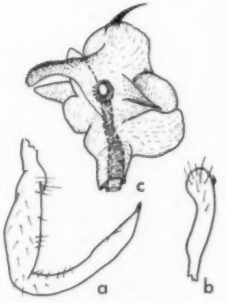

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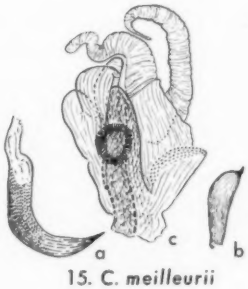

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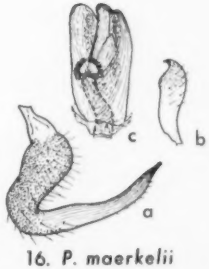
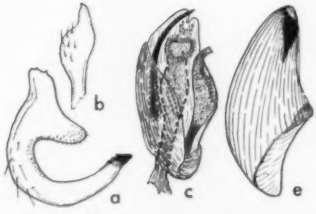


16. *P. maerkelii*

17. *M. gracilis*



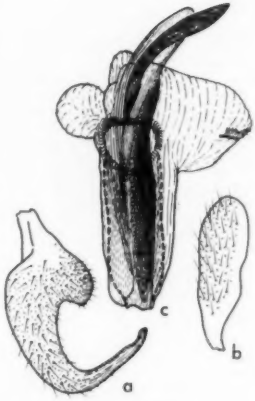
18. *T. cardinalis*

19. *T. rufusculus*

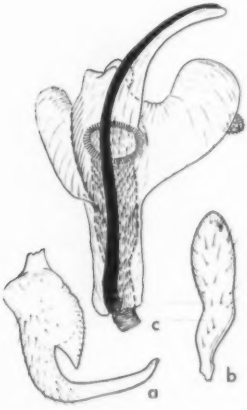
20. *X. plagifer*

21. *X. commissuralis*

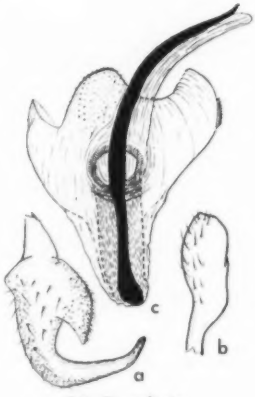
22. *N. tumida*



23. *N. nubilus*

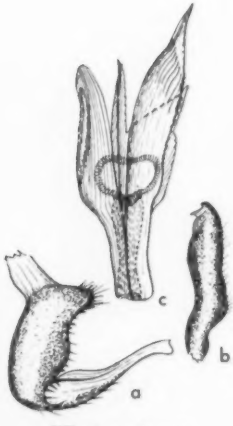


24. *T. scrupeus*

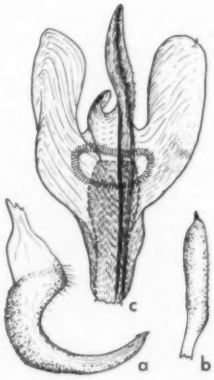


25. *T. salicis*

26. *L. anatina*

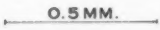


27. *I. sericans*

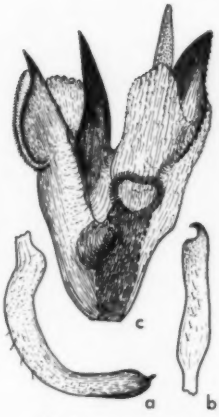


28. *I. pacificus*

29. *A. lineolatus*



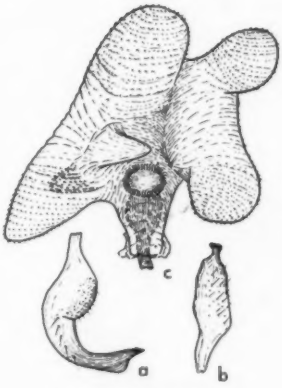
30. *S. franseriae*



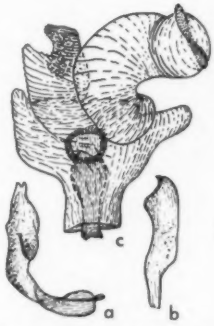
31. *C. norvegicus*

32. *P. chrysopsis*

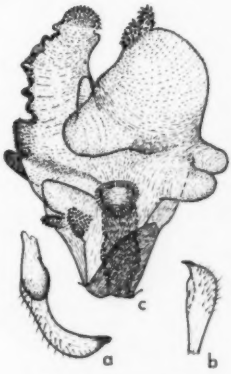
33. *A. flavus*



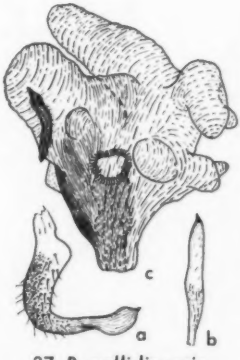
34. *S. binotatus*



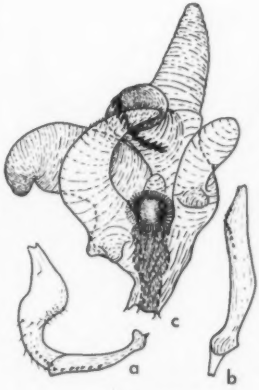
35. *S. nigroquadristriatus*



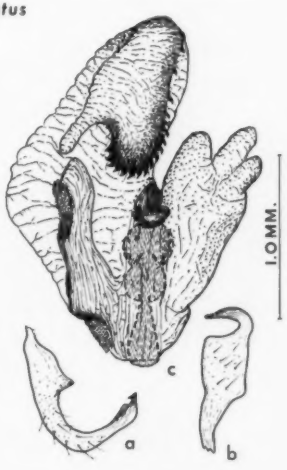
36. *D. suspectus*



37. *P. pallidicornis*



38. *P. tibialis*

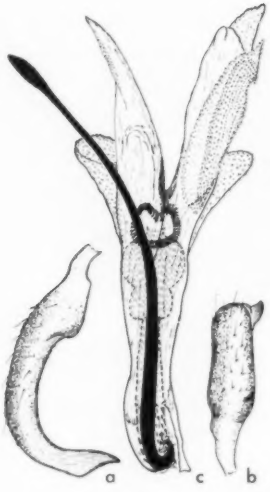


39. *P. grandis*

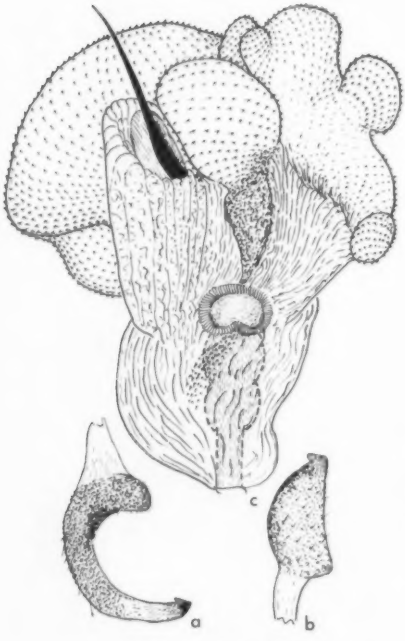
1.0 MM.

0.5 MM.

40. *C. sanguinarius*



41. *C. ater*

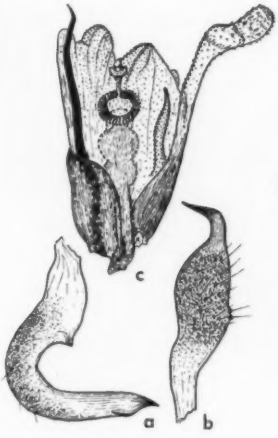


42. *H. dislocatus*

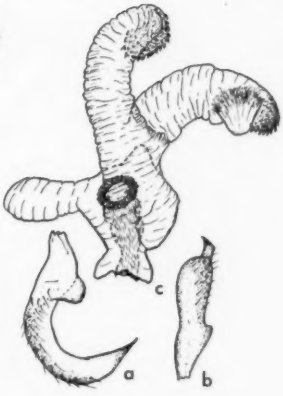
43. *H. sexmaculatus*

0.5 MM.

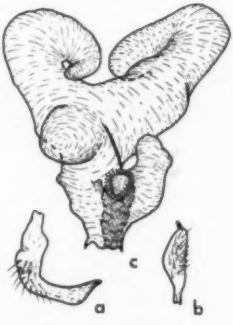
44. *G. filiformis*



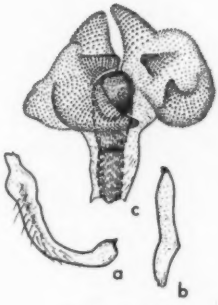
45. *P. lineatus*



46. *L. viburni*



47. *G. fusiformis*



48. *C. debilis*

49. *P. ventralis*

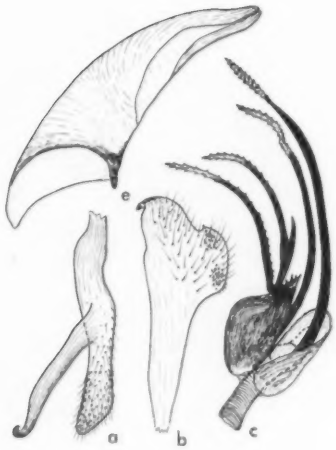
50. *P. insitivus*

51. *P. guttulatus*

52. *D. mediospinosa*

53. *P. formicina*

0.5 MM.

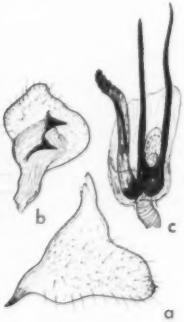


54. *O. notabilis*

55. *O. ornatus*

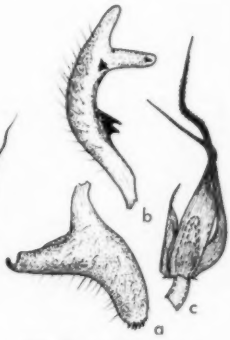
56. *M. atricornis*

57. *M. althaeae*

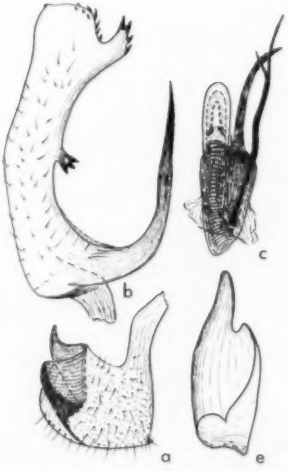


58. *P. artemisicola*

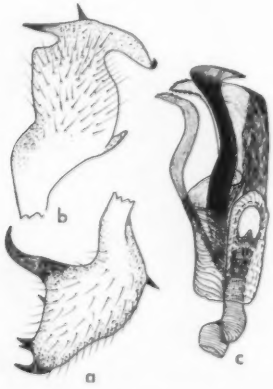
59. *R. fuscicornis*



60. *H. meriopterum*

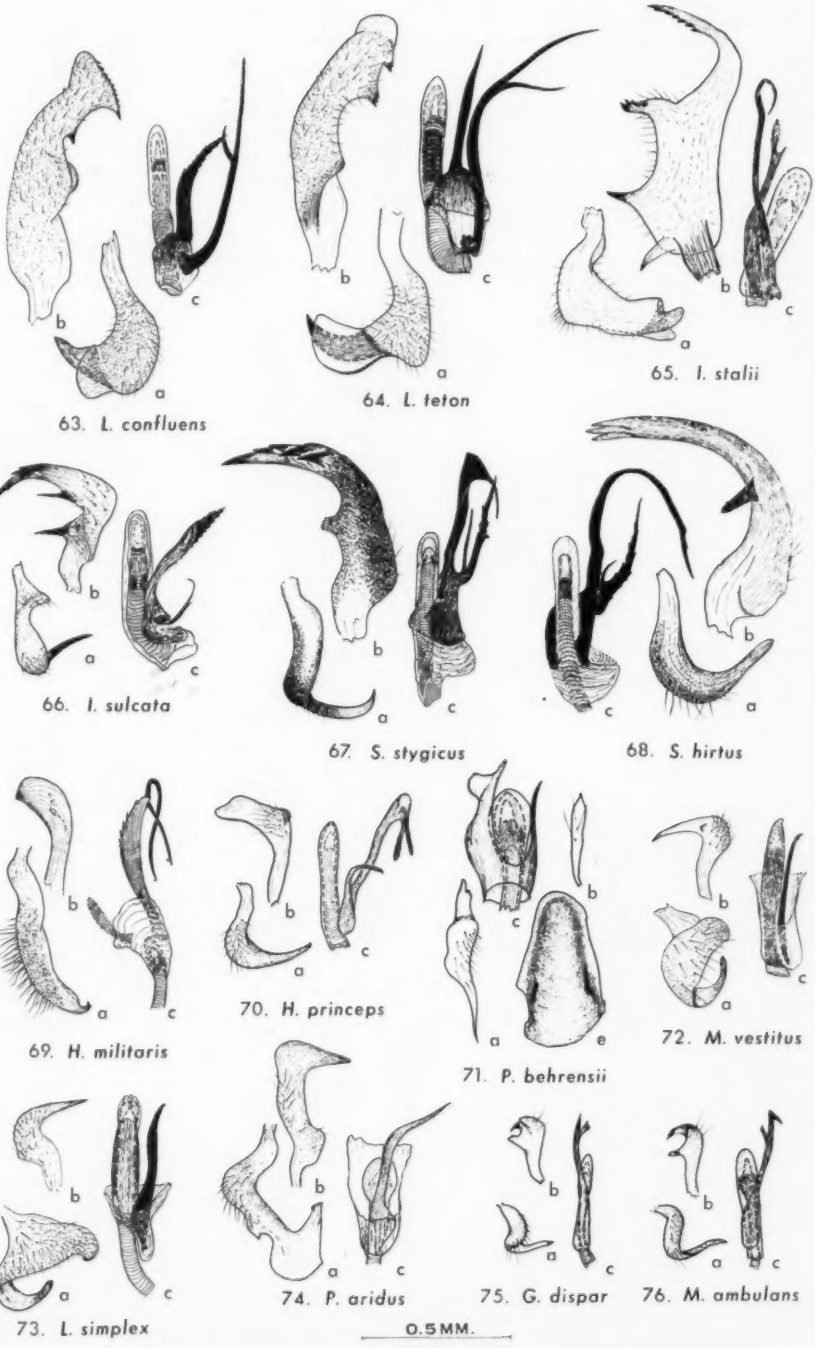


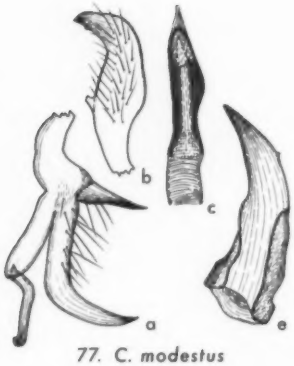
62. *L. media*



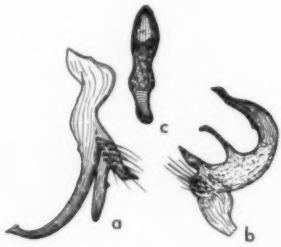
61. *H. malinus*

0.5 MM.


63. L. confluens
64. L. teton
65. I. stalii
66. I. sulcata
67. S. stygicus
68. S. hirtus
69. H. militaris
70. H. princeps
71. P. behrensii
72. M. vestitus
73. L. simplex
74. P. aridus
75. G. dispar
76. M. ambulans
0.5 MM.



77. *C. modestus*

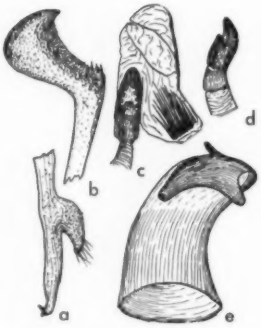


78. *C. pumilus*

79. *S. hirtum*

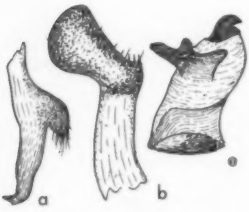
80. *H. apterus*

81. *H. intermedius*

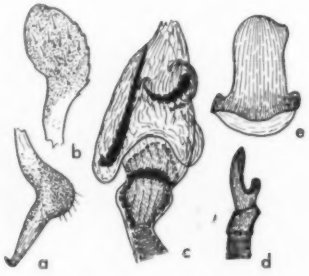


82. *L. hirtus*

83. *H. hesperius*

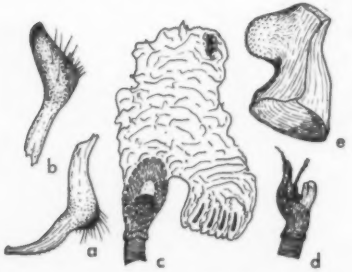


84. *L. sahlbergi*

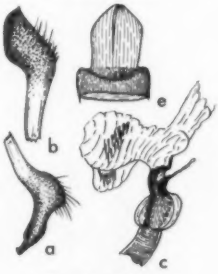


85. *O. mutabilis*

86. *O. brevis*



87. *S. leucocephalus*

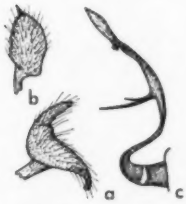


88. *E. nitidus*

89. *P. amoenus*

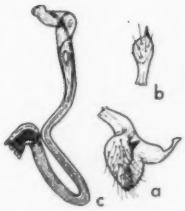
0.5 MM.

90. *P. strobicola*



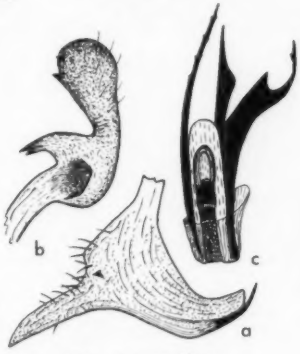
91. *P. clavatus*

92. *A. gracilis*



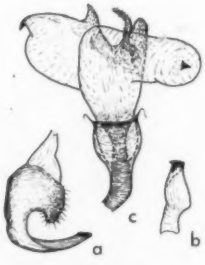
93. *C. albofasciatus*

94. *S. heidemanni*

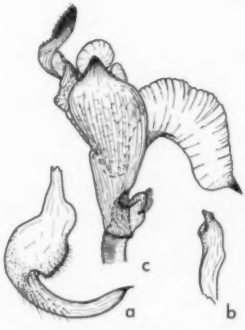


95. *P. scutellatus*

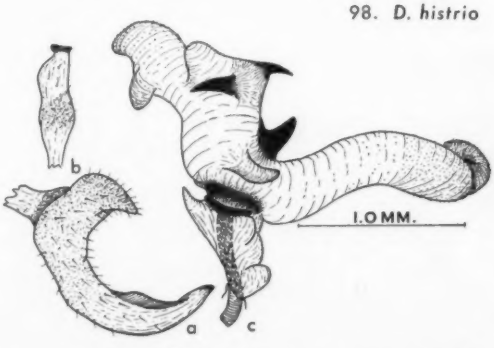
96. *C. modesta*



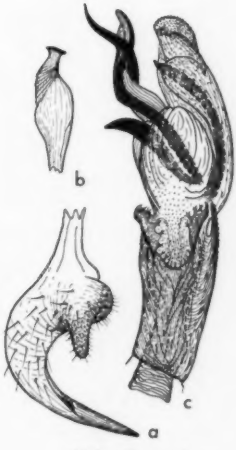
97. *D. atriventris*



98. *D. histrio*

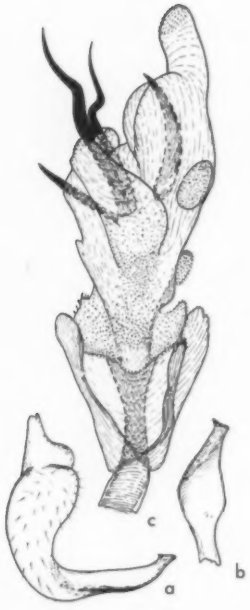


99. *D. segusinus*



100. *D. sayi*

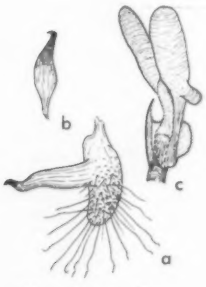
0.5 MM.



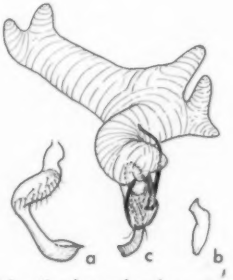
101. *D. fasciolus*

102. *D. aphidiphagus*

103. *D. fraternus*



104. *E. catulus*



105. *K. phorodendronae*

106. *E. luridula*

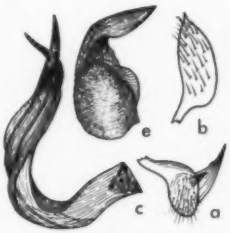
107. *C. villosa*

108. *L. rubida*

109. *H. vitripennis*

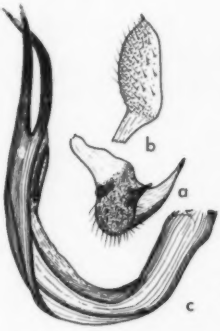
110. *H. harti*

0.5 MM.



111. *P. blatchleyi*

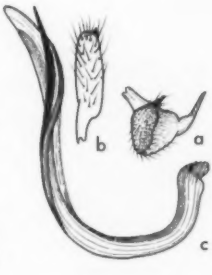
112. *P. fraternus*



113. *P. moerens*

114. *P. longipennis*

115. *M. longirostris*



116. *O. guttulatus*

117. *P. ancorifer*

118. *A. hesperius*

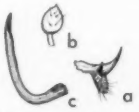
119. *M. tristis*

120. *M. polemonii*

121. *L. rubidus*

122. *M. bohemani*

123. *C. verbasci*

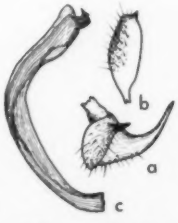


124. *C. saliens*

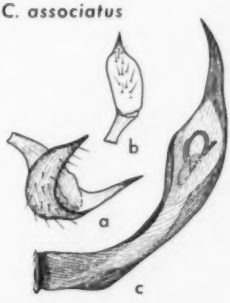
125. *C. associatus*

126. *R. ornatus*

127. *C. insignis*

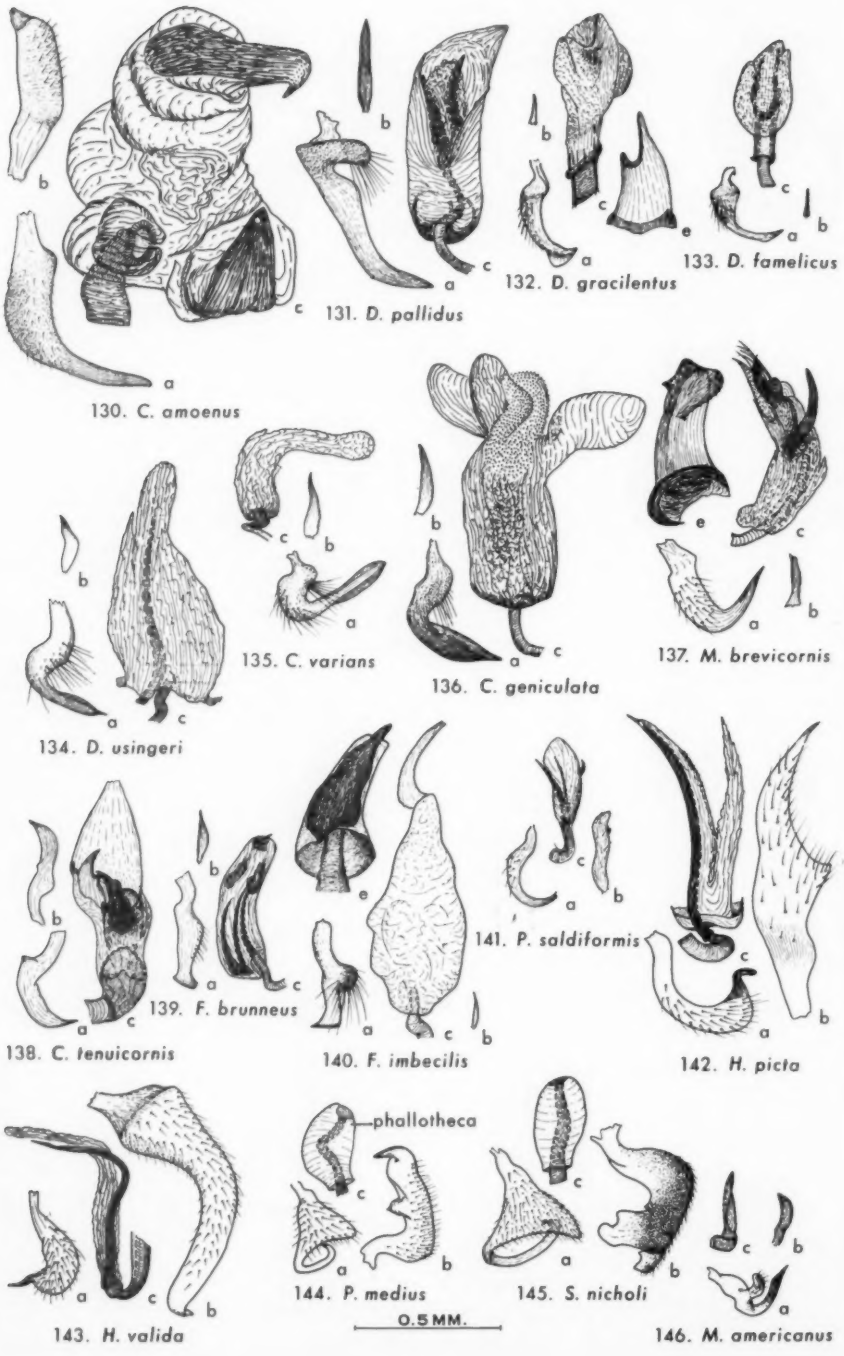


128. *C. mimetica*



129. *O. obliquus*

0.5 MM.


130. C. amoenus
131. D. pallidus
132. D. gracilentus
133. D. famelicus
134. D. usingeri
135. C. varians
136. C. geniculata
137. M. brevicornis
138. C. tenuicornis
139. F. brunneus
140. F. imbecilis
141. P. saldiformis
142. H. picta
143. H. valida
144. P. medius
phallotheca
145. S. nicholi
146. M. americanus
0.5 MM.

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